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IN THE

Supreme Court of the United States

OCTOBER TERM, 1948.

Nos. ~~184 and 185~~ 2

GRAVER TANK & MFG. CO., INC., THE LINCOLN ELECTRIC COMPANY, GRAVER TANK & MFG. CORPORATION,

Petitioners,

vs.

THE LINDE AIR PRODUCTS COMPANY,

Respondent.

ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE SEVENTH CIRCUIT.

BRIEF FOR RESPONDENT.

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December 24, 1948

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ON WRITS OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE SEVENTH CIRCUIT.

BRIEF FOR RESPONDENT.

Opinions Below.

The opinion of the District Court (R. 907) is reported in 75 U. S. P. Q. 231.

The opinion of the Court of Appeals for the Seventh Circuit (R. 990) is reported in 167 F. 2d 531.

Jurisdiction.

Jurisdiction is invoked by petitioners under Section 240(a) of the Judicial Code, as amended by the Act of February 13, 1925, 28 U. S. C. §347(a).

Form of this Brief.

The "Statement of Facts" at page 3, *et seq.* of Petitioners' Brief asks two rhetorical questions and then begins with this statement (p. 4):

> "The result of what the Court of Appeals has done is to regrant to respondent Linde the expired Lincoln, Robinoff, and Miller patents."

Their "Statement of Facts" does not begin to set forth the facts, contains serious inaccuracies and omissions and is defensive and argumentative to a high degree.

In order to correct the inaccuracies and supply the omissions, it is necessary for us to set forth in this brief at some length a statement of the facts as they appear in the record and the points which we believe are actually involved.

In Appendix A to this brief we set forth our correction of errata in the Lincoln brief.

STATEMENT OF THE CASE.

This is an action for infringement of U. S. Patent No. 2,043,960, issued in 1936 on the application of Jones, Kennedy and Rotermund. The patent relates to electric welding.

Decisions Below.

Both the District Court (Northern District of Indiana, Hammond Division, Luther M. Swygert, District Judge), and the Court of Appeals for the Seventh Circuit (Sparks, Major and Minton, Circuit Judges) gave full recognition to the outstanding merits of this invention. Both

Courts unanimously held in favor of plaintiff on all basic questions of invention and patentability and infringement.

Both Courts found on "clear and convincing" evidence that Jones *et al.* "invented an important improvement in electric welding * * * patentable over the prior art." (R. 907-8, 997)

And that this invention made possible welding speeds that "dwarf those of any other method" and produce welds "of the highest quality in contrast to the great amount of porosity contained in the welds produced by the so-called [Robinoff] clay flux process." (R. 907-8, 997)

And that the inventors had discovered "a new process of welding" as well as compositions for use in this process (R. 913, 1002-3).

Both Courts also established that this outstanding invention was fully disclosed in the patent (R. 914, 1002).

And that the invention was copied by defendants, without any work on their part (R. 919-920; Finding No. 22, R. 926; R. 1002-3).

The Trial Court held four of the composition claims valid and infringed, granted an injunction and required a $300,000 bond pending appeal (R. 928, 930). That decision was unanimously upheld by the Court of Appeals.

The only difference between the District Court and the Court of Appeals was on principles of claim construction. This will be taken up below under Points IV through VII, pages 65 through 93.

The Invention.

What constitutes the invention in this case?

These inventors, for the first time in the fifty year history of arc welding, discovered a process in which the welding operation could be carried on within the confines

of a protective molten pool—with the tip of the welding rod in contact with and immersed in a fused pool of the new welding composition or conductive melt. The composition or melt was also invented by these patentees (Opinion, R. 911).

By means of this protective pool, a finished weld can be produced of metal unmatched either in welding or anywhere else in metallurgy (R. 172). All this at electric currents of several thousand amperes—currents never believed to be usable—welding plates of a thickness of 2½ inches in a single pass or traverse of the welding rod, a result never before possible (Finding No. 8, R. 924; R. 540).

Earlier, with a blazing, roaring open arc, such an operation was not only impossible but would have been terrifying to attempt (R. 187). However, in the process of this patent, we have a quiet little pool of flux—no indication at all on the surface that anything is going on beneath the blanket of flux or welding composition—where more than 100 horsepower is being expended in the space of a cubic inch—the power of a large automobile going at full speed—and perfect welds are being produced (R. 187).

The inventors here not only discovered a novel welding process, one of tremendous demonstrated capabilities as respects speed and quality of welding, but they had perforce to discover entirely new compositions of matter for the practice of that process (Opinion, R. 1002).

This is a great invention—a fundamental one—truly a flash of genius.

It "dwarfs" the prior art, it is a "vast" improvement—and these are not advocates' hyperbole, but instead the calm, chosen, considered words of the District Court and of the Court of Appeals, respectively, in describing the invention herein (R. 907, 997).

How different from the prior art, how diametrically opposite, how antithetical to the teachings at the time of their discovery the process and welding composition herein are, can only be assayed against the background of what went immediately before.

How the Invention Came to be Made.

The invention was made by three individuals, Jones, Kennedy, and Rotermund, each at one time or another connected with the University of California at Berkeley, California (Pltf's Ex. 124, off. R. 25, rep. R. 955).

This invention came directly out of their efforts to cure the defects and inadequacies of the so-called Robinoff clay flux welding (R. 31-9, 541). The Robinoff clay flux method, featured in Petitioners' Brief, represented the high water mark for automatic welding—prior to the entry of our three inventors into the field (Pltf's Ex. 124, off. R. 25, rep. R. 955 *et seq.*)

The inventors undertook this as a research project and without any arrangement for compensation (R. 33). They did most of their experimental welding in 1932 at a plant in South San Francisco, where Western Pipe & Steel Company was making large-diameter pipe (R. 31-9). That company was trying to use the Robinoff clay flux method to weld the pipe (Pltf's Ex. 128, off. R. 31, rep. R. 879-883).

This pipe was made of steel plate ½ inch thick. The plate was shaped to form a cylinder. The plate edges came together to form a longitudinal seam, and that was the seam to be welded (Pltf's Ex. 128, R. 879, 881).

Along this seam was heaped a ridge of finely powdered natural clay with lime and ferromanganese mixed in. To perform the welding operation, an automatic machine called a welding "head" moved along this seam. A steel wire

or welding "rod" was fed through the head down to the welding zone. The head also fed a current of electricity into the rod (Pltf's Ex. 128, R. 879; R. 48).

The current formed an open blazing electric arc between the rod and the plate (R. 29, 48; and see Pltf's Ex. 225, off. R. 542, rep. R. 1152).

The extreme heat generated by the arc melted the welding rod and also the edges of the plate. The molten steel then "froze" or solidified to form the welded joint (R. 152).

The violence of the arc blew away some of the powdered clay "flux", but some of the flux was melted and formed a protective gas which partially shielded the molten steel from the air (R. 29).

The Robinoff process produced poor welds. Western Pipe, in using the Robinoff clay flux method, was plagued by "porosity" or "worm-holes"— that is, small cavities in the welded joint making it much weaker than the plate itself (R. 32, 57, 541, 879). Such holes reduced the metal available for supporting stresses and served as nicks or notches to promote easy failure (R. 146-7). They constituted a serious defect and required extensive use of hand welding to repair the welds before the pipe could be used (R. 32, Pltf's Ex. 128, off. R. 31, rep. R. 879).

Western Pipe first sought the advice of other welding experts named Lester and Strobel, but they were not able to cure the defects in the Robinoff process (R. 32, 138).

Thereupon, Western Pipe enlisted the services of the three inventors of the patent here in suit—Messrs. Jones, Kennedy and Rotermund (R. 32-3).

These three, after working for six months and conducting a series of approximately 500 experiments, produced this invention (R. 32-3). In the course of this work they compounded 75 different flux compositions. The flux formulae and the welding conditions and results and other

data pertaining to their experiments and tests were contemporaneously recorded and tabulated in their shop notes, which now take up 112 pages of this record (Defts' Ex. 88, off. R. 425, rep. R. 1153-1264).

Under this invention, a new granular material is used, instead of the old clay flux. As the Trial Court found, this new material operates in an entirely different manner (Opinion, R. 911). It melts—but, instead of forming gas, it forms a pool which entirely surrounds and confines the welding action—eliminating gas and making it possible to employ much greater amounts of electric power and to weld and deposit metal at rates never before dreamed of.

This invention cured the porosity and defects which plagued the old clay flux welding, and produced welds of the highest quality. (Opinion, R. 907-8).

The concurrent findings of the courts below are expressed in this succinct and unqualified statement of the Court of Appeals:

> "The District Court said, and we think rightly, that Jones, Kennedy and Rotermund invented something patentable over the prior art of electric welding. He thought their method of welding differed vastly from electric-arc hand welding, either of the bare or coated rod variety, and that there was 'an inventive level-difference' between their method and Robinoff's automatic welding method." (R. 997)*

Limitations of the Prior Art.

The inventors, on the first page of the patent in suit, gave a statement of the prior art at the time they did their experimental work (R. 955). This statement is a most complete disclosure of the prior art of electric welding.

The opinion of the Court of Appeals also goes at length into the prior art welding (R. 991-2).

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*Emphasis supplied throughout.

There were three earlier types:

bare rod welding,
coated rod welding, and
welding with a layer of powdered clay flux (the so-called "Robinoff process").

Bare Rod Welding.

Arc welding with a "bare rod" is the oldest of the three prior-art methods. It is of familiar appearance.

In bare rod hand welding the operator gripped the bare steel rod in a holder or clamp, struck an arc between the rod and the plate, and moved the blazing arc along the plate edges. There was a blinding glare with so much smoke and splatter that the operator had to wear a mask. The heat generated by the electric current caused the tip end of the rod and a bit of the plate edge to melt and to form a welded joint (R. 44-6).

The process was slow and laborious. A bead or layer of metal no more than ⅛ inch in thickness could be deposited in a single "pass", that is, one passage or traverse of the welding rod along the seam to be welded (R. 143). The current usually employed in bare rod welding was about 200 amperes (R. 95, 883).

The molten metal was completely exposed to the air during welding and reacted with the oxygen and nitrogen of the air. This produced brittle welds of inferior quality (R. 173-4).

Coated Rod Welding.

Then came "coated rod" welding. The welding rod, instead of being left bare, was encased in a coating of some kind of a material and this was called a "flux". The operator manipulated the coated rod in exactly the same manner

Fig. 1. *Coated Rod Welding*
(Pltf's Ex. 15a R. 228)

Deposits ⅜ inch bead of metal. Employs 225 amperes of current. Shows dazzling open arc.

described above with respect to the bare rod, and there was the same blazing open arc (R. 453).

Figure 1 (Plff's Ex. 156, off. R. 228) shows coated rod welding with its typical dazzling open arc, smoke and splatter (see Finding No. 5, R. 924). The current was 225 Amperes (R. 95, 883).

As the rod melted, the flux coating also melted and generated gas. This served to shield the molten metal from the air and resulted in an enormious improvement in quality of weld metal deposited (R. 174).

Coated rod welding has had and still has an important place in electric welding. According to the testimony of James Finney Lincoln, president of The Lincoln Electric Company, the coated rod accounts for something like 90 percent of all electric welding (R. 442). To take an example, on a ship under construction on the shipways, much of the welding is either overhead or vertical and must be done by hand with a coated rod (R. 360).

There is also a health hazard. The operator bends closely to his work, protected from eye burn by a welder's shield, but still exposed to the smoke and fumes (R. 177).

The great disadvantage of coated rod welding is that it is slow, laborious and costly. It is not possible to deposit a bead more than 1/8 inch thick at a single pass, and the amount of current which can be used is rigidly limited—something less than 300 amperes (R. 177).

In order to weld any plate thicker than 1/8 inch, the operator must use a multiplicity of passes and lay down enough 1/8-inch beads to fill up the "V" made by the beveled edges. Frequent stops must be made to insert a fresh rod in the holder. After each pass, the operator stops to chip off the slag left by the coated rod (R. 115).

Thus welding was the bottleneck in many manufacturing and construction industries. There was a great deal

of work suitable for automatic welding—for a process which would speed up welding, use heavy currents and weld thick plates, and give good quality welds. In many plants such welding would make it possible to turn out much more product without additional plant investment (R. 389-92, 395-99).

Over a long period of years many attempts were made to mechanize electric arc welding. They were not successful, and welding lagged behind other industrial techniques (R. 47-9).

The automatic machine called a "welding head" has been mentioned above. When bare rod was used in the automatic welding head, the quality of the weld produced was still extremely poor because the molten metal was exposed to the air (R. 48). On the other hand, it was very difficult to mechanize the coated rod. The coating was an insulator and created difficulties in feeding the current into the rod (R. 48). These difficulties are explained in the opinion of the Court of Appeals (R. 991-2).

Moreover, no increase in welding speed was possible through mechanization of the coated rod process, as an attempt to use a heavier current sends the molten steel flying in a useless splatter (R. 177).

Robinoff Clay Flux Welding.

One of the attempts to develop an automatic process was the "Robinoff" clay flux process. It was used to weld pipe for a short period beginning in 1931 by National Tube Company at its Christy Park plant and then abandoned except for a small amount of pipe made in 1935 (R. 393, 539-40).

The only other place this process was used was at the Western Pipe & Steel Company, where the inventors saw it in operation in 1932 (R. 28-9, 541).

Both of these companies are now licensees under the Jones *et al.* patent (R. 395, 398).

In the Robinoff process, the flux was laid in a ridge along the seam to be welded instead of using it as a coating on the rod. The welding rod was bare. This process depended upon the evolution of gas to protect the molten steel from the air (Finding No. 26, R. 927).

In the Robinoff process, a large amount of flame, smoke, and fumes was produced. A photograph is printed at R. 1152 (Pltf's Ex. 225, off. R. 542). This was taken at the National Tube Company about 1931. The photograph shows the blazing open arc—the operator is not only wearing goggles, but, in addition, he is also holding a shield in his left hand.

The pyrotechnical appearance of the Robinoff process was shown at the trial in an actual laboratory demonstration (No. 5) which the Court attended; and the striking contrast between that method and the process in suit was shown at the same time in plaintiff's Demonstration No. 4. These are illustrated in the motion and still pictures (Pltf's Exs. 152-155, off. R. 227), which the Trial Court found to be correctly representative of the demonstrations (Finding No. 5, R. 924).

The Robinoff process was used with some success on ¼ or even ⅜-inch plate, in making pipe where little or no attention was paid to quality of weld (R. 540). We have already described above at pages 5-6 the Western Pipe & Steel Company's efforts to use the Robinoff process on ½-inch plate using 700 amperes.

Any plate thicker than ½ inch was out of the question and even with ½-inch plate a man got inside the pipe and hand welded a bead along the inside of the seam (R. 540). Robinoff testified that the maximum current was

650 to 700 amperes (R. 540), and defendants' counsel so stated when we were giving the court a laboratory demonstration of the Robinoff process as used at Western Pipe & Steel Company (R. 99). Increasing the electric current in the Robinoff clay flux process above this maximum ruined the operation completely. A test with 1,500 amperes was made for the Trial Court (R. 99). The resulting deposit, if it could be called a weld, was wholly useless (R. 98-9, 799). Yet a weld made under identical conditions with the Jones *et al.* process gave excellent results (R. 799).

Experimental Work Leading to the Invention in Suit.

Jones, Kennedy and Rotermund, the free-lance inventors called in by Western Pipe & Steel Company, were well qualified by education and experience for the task.

Lloyd T. Jones had received a Ph.D. in Physics from the University of Illinois in 1915. He was a member of the faculty of the Physics Department at the University of California for fourteen years. He was well known for his welding investigations and articles extending over a number of years (R. 133-7).

Harry E. Kennedy had graduated in Electrical Engineering from the University of California in 1914. He had continued as a research engineer and free-lance inventor and maintained a complete experimental shop. He was awarded the Lincoln Gold Medal by the American Welding Society. He is a Research Associate in Engineering at the University of California. During the war, he collaborated with the U. S. Navy in developing a joint for the magnetic cable (R. 26-8).

Maynard A. Rotermund was a member of the electrical engineering faculty at the University of California, and

collaborated with Jones and Kennedy in experimental work in welding beginning in 1927 (R. 136).

Their 500 welding tests and their 75 experimental fluxes have been mentioned above, page 6.

Almost at the outset the inventors came to the conclusion that the Robinoff process was fundamentally defective. That process depended upon a tremendous volume of gas to protect the molten steel. After study, Jones *et al.* concluded that this gas was in fact the cause of the porosity, and that they should avoid the evolution of gas (R. 33-34; Finding No. 6, R. 924).

That was in itself a very startling decision. Up to that time gas was regarded as necessary and essential. All progress in welding had been along the lines of producing more and more gas (R. 175). No one had ever thought that the gas caused trouble. The others, who tried to eliminate porosity, thought it was caused by magnetic currents or electrical disturbances (R. 33, 56; Pltf's Ex. 128, off. R. 31, rep. R. 880).

Robinoff himself was asked at the trial:

> "And is it not a fact that you did not know as to the causes of the pinholes?"

Robinoff answered:

> "I still don't know." (R. 541)

Thereupon, Jones, Kennedy and Rotermund promptly discarded the limited objective of merely substituting a new flux for use in open arc welding (R. 38). Instead, they addressed themselves to the much greater objective of creating an entirely new process having none of the disabilities and limitations of the Robinoff clay-flux process. The inventors concluded that the welding zone should be com-

pletely sealed in from the air by molten material, and that in order to operate successfully the tip of the welding rod had to be immersed in the molten pool of welding composition (R. 41).

Initially, they experimented with foundry slag, a prefused material they were able to buy (R. 34-5). But they promptly concluded that, to accomplish their objective, they had to create a brand new, specially prepared, prefused composition (R. 37-8).

A large part of their work was in learning that the very things recommended by the prior art for open arc fluxes, such as the borax and sodium carbonate of the J. C. Lincoln patent and the iron oxide especially commended by Robinoff in his secret formula, were not suitable in their new process (R. 38).

They found, as they continued their hundreds of experiments, that they were able to break through the rigid limitations of the prior art—that their process could employ higher and higher welding currents; and more and more weld metal could be deposited (R. 40-1). No limit has yet been found to the current their process can utilize, no plate too thick for Unionmelt to weld (R. 40).

The inventors' shop notes (Defts' Ex. 88, off. R. 425, rep. R. 1153-1264), their first patent application (Pltf's Ex. 125, off. 26, rep. R. 1043-73), and the extended testimony given by Harry Kennedy (R. 28 *et seq.*) show that step by step they worked out the requirements of their new welding process and the properties the material or "melt" (a coined word) must have—that is, its electrical conductivity, fluidity, viscosity and specific gravity.

The new "melt" had to serve a number of purposes never before served by the older fluxes, and specific characteristics were required for it to operate successfully in

the process (R. 168-171). Their patent (pp. 2-3, R. 896-7) explains, in unusually complete detail, the ingredients, proportions, preparation, and physical and chemical characteristics of the new composition (R. 255-6).

Anyone can take their patent and learn therefrom how to make a melt such as Unionmelt 20 or Unionmelt 90 or Lincolnweld 660 flux (R. 255-6, 279-281).

The three inventors were completely without guide in the new field. There were elements of accident or luck. And there was original thinking of the highest order. And there was plenty of plain hard work—for inventive genius is like other forms of genius in that respect. These three men, working on their own, would go to the plant in South San Francisco at four o'clock in the afternoon when they could have the welding equipment to themselves. They would not stop work until they had to leave to take the last ferry back to Berkeley and sometimes it was the first boat the next morning. Kennedy estimated they worked together for about a thousand hours during that six months period in 1932 (R. 34-5).

In Flux No. 68, first used in Test No. 422, the inventors found they had a thoroughly satisfactory type of melt, a calcium magnesium aluminum silicate with calcium fluoride added (R. 42-3). That is the preferred material described in their patent (p. 2, col. 2, ll. 51-63, R. 956). It is the composition Unionmelt Grade 20 marketed as a standard grade today by The Linde Air Products Company (R. 256; Pltf's Ex. 194, off. R. 333, rep. R. 896).

The inventors then determined to see whether other materials would serve, and they fused a manganese silicate with calcium fluoride added, and welded with it and established that it would function in the same manner (R. 42-3; Defts' Ex., 88 Flux No. 70, Test No. 424, R. 1162, 1255-56).

And that is Lincolnweld 660, the accused flux manufactured, sold and used by the defendants herein (R. 257).

Thus, the inventors' notes and testimony show that during their experimental work they made and welded with both of these compositions, now marketed as Unionmelt Grade 20 and Lincolnweld 660 flux, and that they found them to be identical in operation and result.

The Linde Air Products Company.

Plaintiff, The Linde Air Products Company (a subsidiary of Union Carbide and Carbon Corporation), learned of the invention and became interested in acquiring it after Jones *et al.* had filed their first application in the U. S. Patent Office. In November, 1933, an agreement was negotiated whereby the inventors assigned their invention but retained a substantial share of the royalties (Pltf's Ex. 162, off. R. 140).

The Linde Company, not then engaged in electric welding, decided to enter the field for the purpose of promoting the adoption of the Jones *et al.* invention (R. 386).

The Linde Company, with the help of the inventors, did a great deal of work to demonstrate the adaptability of the new process to various types of welding applications (R. 387-9; Pltf's Ex. 210, off. R. 387). Early in 1935 the first plant installation of the new process was made at the Consolidated Steel Company in Los Angeles to try it out under actual factory conditions, and there was a period of trial at other plants (R. 389-393). The Jones *et al.* process came to be known in the business world as the "Unionmelt" process (R. 395).

In 1938 public announcement of the Unionmelt process was made. Thereupon the Linde Company offered the Unionmelt process to all comers and then entered into

competition with The Lincoln Electric Company and other long-established companies (R. 395).

Since that time more than 740 licenses have been granted to companies in a variety of fields (R. 395). The Linde Company availed itself of the Patent Office procedure by registering this patent and offering licenses on standard terms to all applicants (R. 399; Pltf's Ex. 214, off. R. 399).

The licensees, up to the trial, had paid an aggregate of $6,000,000 in royalties for the use of the process (R. 395). Of that amount $1,200,000 was paid over to the inventors as their share fairly representing the great merit of their invention (R. 44).

In return American industry has enjoyed the use of this invention with much economy and advantage to the public interest. The royalties paid have been but a small fraction of the savings realized through use of the invention.

The Lincoln Electric Company.

The Lincoln Electric Company of Cleveland, Ohio, is the principal defendant and openly assumed the defense for its co-defendants, the two Graver companies (Finding No. 3, R. 923).

The Lincoln Company entered the electric welding field as far back as 1907 and has long held a dominating position, as it does today (R. 436-7, 441). For many years it has advertised itself as the "largest manufacturer of arc welding equipment in the world" (R. 410, 471).

In spite of the strongly entrenched position of Lincoln Electric Company, the Unionmelt welding process cut heavily into its business (R. 467-8). James Finney Lincoln wanted to get for his Company and its customers a license under which they would not pay royalties, at a time when others were paying standard royalties (R. 471-2; Pltf's

Exs. 219, 220, off. R. 472, rep. R. 1147-48). The Linde Company was ready to grant a license to anyone on the same terms as everybody else, but not otherwise (R. 399).

Lincoln, nevertheless, went ahead and brought out Lincolnweld 660 flux which the Trial Court found was copied directly from the Jones *et al.* patent:

> "the lack of any evidence of independent research or experiments by the Lincoln Electric Company in originating Lincolnweld 660 flux creates an inference that the teaching of the patent in suit was the sole origin of that composition." (R. 920).

Parenthetically, this fact is excellent proof of the sufficiency of the disclosure in the Jones *et al.* patent.

In 1942 the first factory installation of the Lincolnweld process was made at the plant of the Graver companies in East Chicago, in the Northern District of Indiana, where the case was tried (R. 377). All defendants used the accused process and composition at that plant (Finding No. 18, R. 926). As long as the war was on, officers of the Linde Company did not want to take their time and attention away from vital war work, but as soon as the war was over the complaint in this suit was prepared and filed.

The Lincoln Electric Company has widely exploited the accused Lincolnweld process and flux, and in doing so gave guarantees of patent protection to its customers (R. 411).

The Lincoln Electric Company issued a catalog describing "Lincolnweld" as "the new automatic shielded arc welding process" and "another milestone in the history of arc welding." (Pltf's Ex. 203, off. R. 369; R. 475.)

Figure 2, which we have inserted in this brief, is the illustration appearing on page 1 of the Lincolnweld catalog.

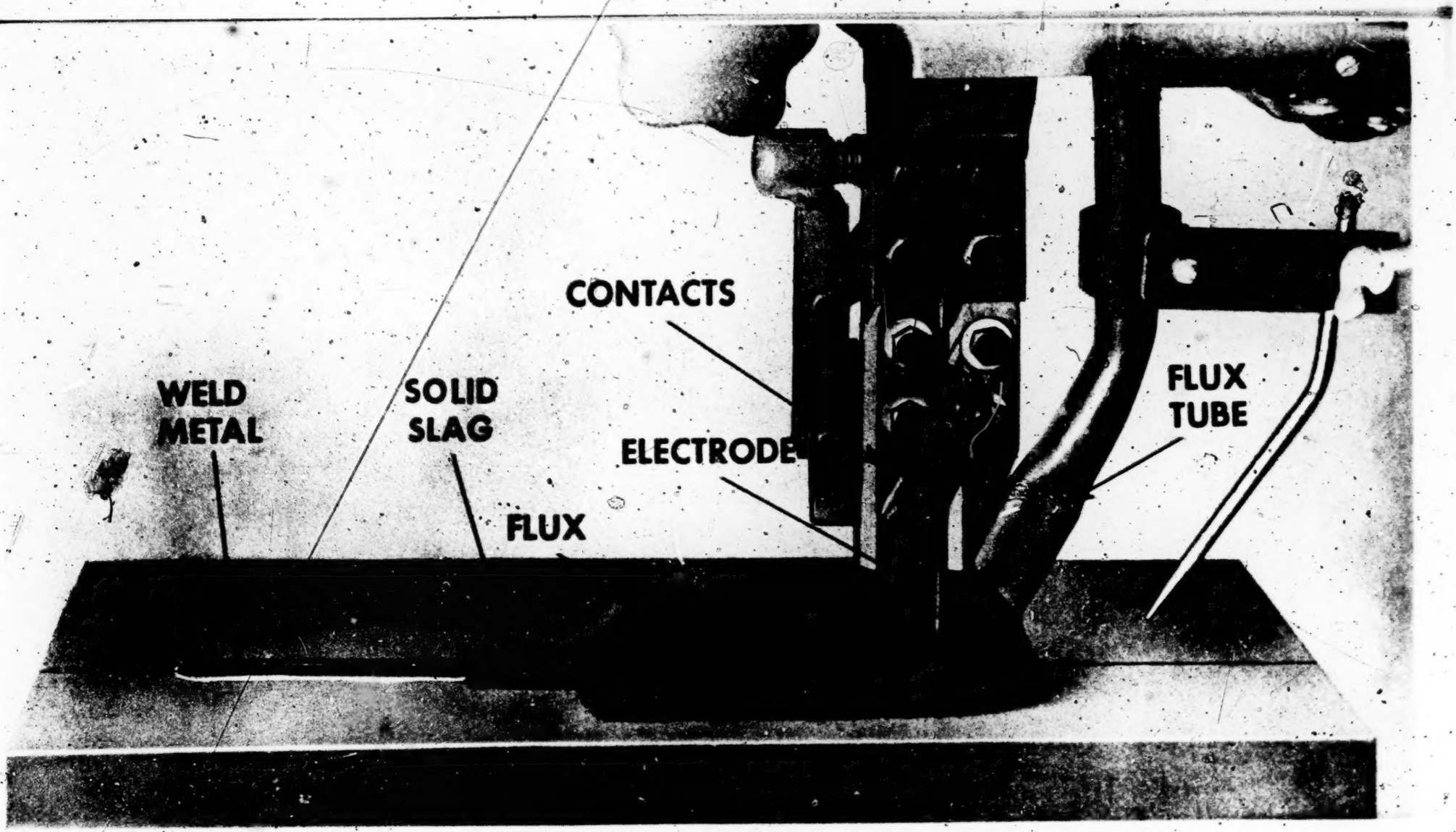

Fig. 2. *Infringing Lincolnweld*
(Plff's Ex. 203; R. 369)

Illustration appearing on page 1 of Lincolnweld catalog. This catalog states at page 4:

"Absence of smoke, fumes, radiated heat, spatter and visible arc eliminates the discomforts of conventional open arc welding . . ."

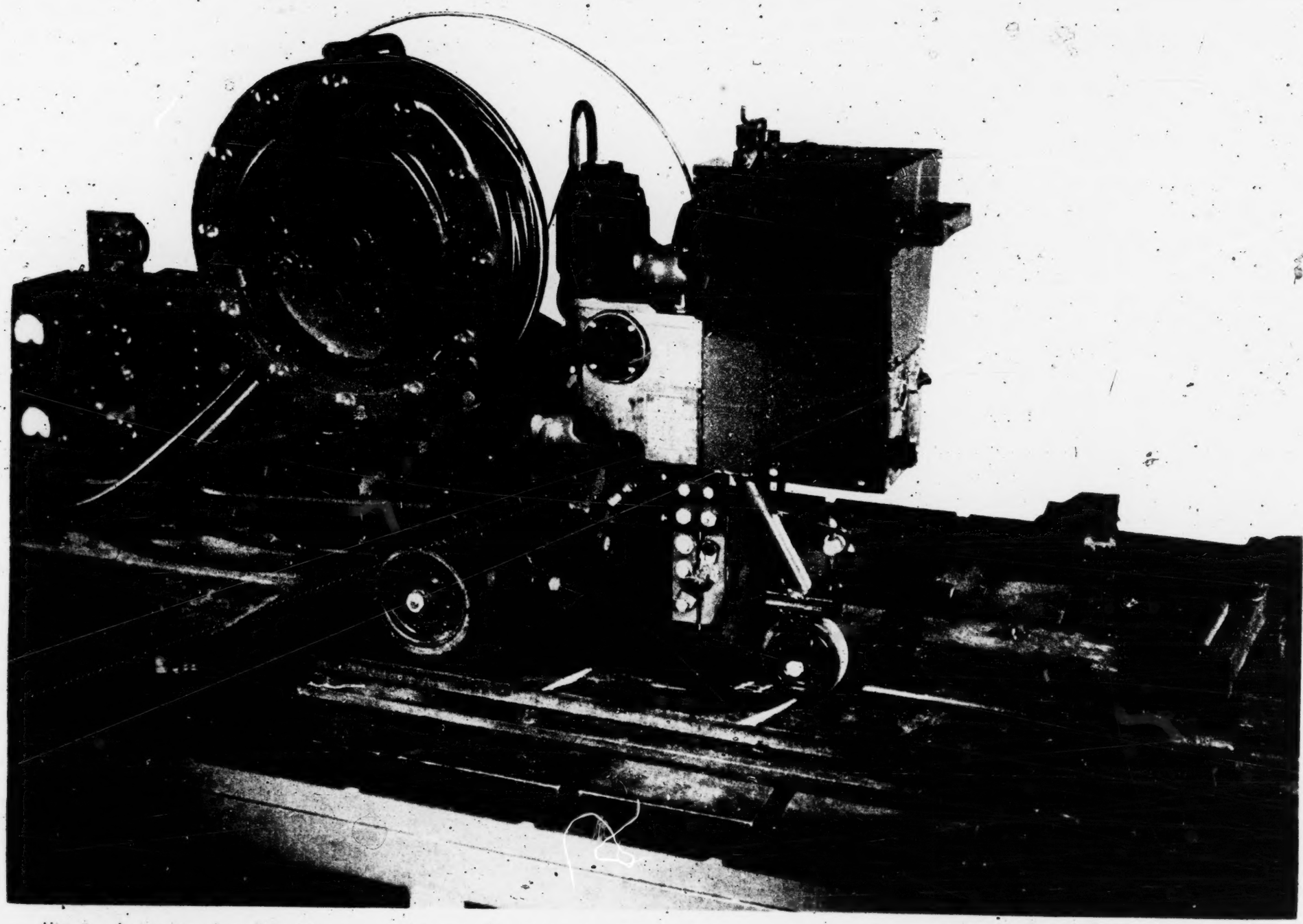

Fig. 3. *Intramatic Lincolnweld*

Photograph of Lincolnweld "head" in actual operation welding 1 inch steel plate. Steel rod (electrode) unwinds from reel and goes through contact jaws which feed electric current into rod. The weld is taking place beneath the quiet layer of granular Lincolnweld 600 that covers it, thus shielding the molten metal from

Figure 3, also inserted in this brief, is a photograph which accurately portrays the operation of the infringing Lincolnweld process (Pltf's Ex. 189, off. R. 226). This photograph was taken while the welding head was actually in operation welding 1 inch steel plate and shows that there is no visible manifestation whatsoever of anything taking place beneath the quiet layer of granular flux.

The description of the accused Lincolnweld process in defendant Lincoln's catalog emphasizes the difference from "conventional open arc welding":

> "Absence of smoke, fumes, radiated heat, spatter and visible arc eliminates the discomforts of conventional open arc welding and results in an increased operating factor for lower welding costs." (Pltf's Ex. 203, p. 4, off. R. 369; R. 370)

The Lincolnweld catalog itself states that this new "welding boosts production 800%." (Pltf's Ex. 203, p. 13)

Lincoln's statements to the public in his catalog belie their statements to the Court that there is nothing new about Jones *et al.* welding—that it is just the same as the prior Lincoln and Robinoff welding—and that they had it all the time.

Before this suit was filed, James Finney Lincoln himself described the Robinoff patent in writing as "very much restricted" and "very largely a detail patent." (R. 477) Yet he now asks this Court to believe that Robinoff had done everything that Jones *et al.* did.

One further fact is highly significant—the date Lincoln took a license under the Robinoff patent. That date was May 18, 1945 (R. 578)—just three years after the actual installation of the Lincolnweld process at the Graver plant in East Chicago (R. 377)—and two years after Lincoln had put Robinoff on his payroll so he would be available for the purposes of this litigation (R. 531).

It is little wonder that defendants were very reluctant at the trial to produce the date of their Robinoff license (R. 476, 532, 578)—and little wonder that nowhere in Petitioners' Brief is there any mention of this date, although many, many references to the fact that Lincoln took a license under the Robinoff patent.

Outward Appearance of Jones *et al.* Welding.

The simplest proof that Jones *et al.* achieved something radically new is the outward appearance of the new welding operation. Both lower courts remarked upon it (R. 907, 996).

Gone the noise, the splatter, the smoke and fumes (R. 907).

Gone is the blinding, open arc invariably present in and featuring all prior electric welding (R. 907).

Instead, the welding action takes place underneath a quiet layer of granular material, with no visible manifestation of the welding process (R. 187).

Extraordinary indeed is the contrast even as to appearance between the open arc in hand welding and the operation of the Jones *et al.* process. But that does not begin to tell the story. The hand welder employs a current of less than 300 amperes (R. 95, 883).

The Jones *et al.* process takes a current of 3,000 amperes or more representing more than 100 horsepower*, and confines that tremendous force peacefully within a pool of about a cubic inch of molten composition—enshealthing a vapor core or arc no bigger than the tip of the little finger (R. 788).

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* The power expended in the arc is the product of the current in amperes multiplied by the volts (a welding arc takes about 30 to 40 volts). This gives the number of watts of power, 746 watts being equal to 1 horsepower.

It is almost incredible to people used to dealing with electric arcs, that this unique arc can be formed and confined in this little pool (R. 187). An ordinary arc of 3,000 amperes would be a terrifying thing to see and hear. It would shake the building and strike with the blast of a fire hose.

Now what answer do the defendants make? How do they explain this well-nigh incredible feature of the new welding operation?

They don't even attempt an answer or explanation. They are not able to say one word. The Court can search Petitioners' Brief through from beginning to end and not find a single reference to this salient point.

Performance Capabilities.

The testimony is uncontradicted that the Jones *et al.* patent represented a great stride forward in the welding art. That is another remarkable feature of this case.

Even James Finney Lincoln, on his cross-examination, was forced to admit this great advance in the art (R. 466).

This invention made it possible to weld steel plate 2½ inches thick at a single pass (Finding No. 8, R. 924-5)—whereas ½ inch plate was the thickest ever attempted with the Robinoff Process (R. 540) and to get good quality or multiplicity of ⅛ inch beads were laid down with coated rod welding (R. 177).

This invention uses currents of 3,000 amperes or more (Finding No. 8, R. 924-5)—whereas a current of 700 amperes was used in the Robinoff process (R. 540) and currents of 200 to 300 amperes were used in bare rod and coated rod welding (R. 95, 883). The rate of welding depends on the magnitude of the current (R. 187). The Jones *et al.* process not only utilized much heavier currents, but also made much more efficient use of the current by avoiding loss of heat (R. 187).

In fact, the testimony is uncontradicted that the limitations of the thickness of the plate to be welded and the current usable with Jones *et al.* have yet to be found (R. 40).

The speeds of welding by Jones *et al.* exceed any ever known before, for instance, 120 inches per minute on light plate (Finding No. 8, R. 924-5)—whereas, about 10 inches per minute was the speed of welding in the Robinoff process (R. 884).

And as to quality of weld metal deposited, the welds produced by the new invention are excellent and entirely free of porosity (Opinion, R. 907-8)—whereas Robinoff welds, even in ½ inch plate with a speed of 10 inches per minute, required extensive patching and repair (Pltf's Ex. 128, off. R. 31, rep. R. 881; Pltf's Exs. 223, 224, off. R. 542; R. 549-552).

So radically new is the patented process that the metallurgical properties of the weld metal are unmatched anywhere else in the field of metal working. It is unique, not simply in welding, but anywhere in the field of metallurgy (R. 172).

The advance made by this invention is described by the courts below as follows:

> "The truly remarkable difference, however, between what Jones, Kennedy and Rotermund invented and what had gone before is perhaps best manifested by the performance achievements of their invention. For instance, only through its use can plates as thick as two and one-half inches be welded in a single pass. Furthermore, the welding speeds made possible by it dwarf those of any other method, and the welds produced by it are of the highest quality in contrast to the great amount of porosity contained in the welds produced by the so-called clay flux [or Robinoff] process." (Opinion of Trial Court, R. 907-8; quoted by the Court of Appeals, R. 997)

From the outset we have regarded this as by far the most important feature of the case. We have given it top billing in all our briefs and arguments.

And what answer do defendants make? How do they explain this revolutionary advance, this "truly remarkable difference?" Here again they don't even attempt to answer. Here again they are not able to say one word. Here again the petitioners' brief makes no mention whatsoever of this most important feature.

Their cool description of the invention as a "modest" discovery is surely a classical example of understatement.

Importance to Industry.

The extraordinary performance capabilities of the new welding—as to thickness of plate to be welded, amount of current usable, speed of welding, and quality of weld metal deposited—were realized, not merely in the experimental shop, but in actual plant operation as well. The invention in suit was put to wide practical use and received the endorsement of American industry (R. 389-93, 394-9).

As the Trial Judge found:

> "Extensive commercial success has resulted from the exploitation of the invention by the plaintiff and its licensees * * *." (Finding No. 9, R. 925)

This is all the more significant, by reason of the fact that the plaintiff Linde was a newcomer in the electric welding field (R. 386)—and came into competition with The Lincoln Electric Company and other long-established companies (R. 408, 410).

The licensees under the patent in suit include the leading American companies employing welding in a variety of fields—shipbuilders, pressure vessel fabricators, railroad equipment manufacturers, steel companies and general

manufacturers. Even such leaders in electric welding as the General Electric Company and the Westinghouse Company have taken licenses under the Jones *et al.* patent (R. 395-9).

During the war this process was used very extensively in shipbuilding—and also in the production of gun mounts, bombs, armor and other war equipment and material both for the Army and Navy and in practically every industry producing for the Army and Navy (R. 411).

Those ships and tanks and gun mounts were not weakened by pinholes or porosity—they were welded with good sound welds.

During the greatest national crisis our country has ever faced, the performance capabilities of this process became most essential.

Manpower was a most critical factor in war production, and there is much evidence in this record of the tremendous savings in man hours effected by the Unionmelt process (see, for example, R. 361-2, 366-7, 381-3).

Witnesses representing a number of these licensees testified in the lower Court, and the Trial Judge commented:

> "testimony by users of Unionmelt that the Jones, *et al* method permits faster welding, saves costs and constitutes a vast improvement over hand welding is highly convincing that the method under inquiry is an invention." (R. 908)

The War Department and the Navy Department took licenses from the Linde Company at the standard rate for the use of the Unionmelt process (R. 399, 411). Also there was a statute under which the Government was empowered to review and reduce patent royalties on war production [56 Stat. 1013 (1942)] and the record does not suggest any step on the part of the Government to recoup any part of the royalties paid to and retained by the Linde Company.

Here is another zone of silence in Petitioners' Brief. Nowhere do they make any attempt to answer or explain away this "highly convincing" evidence of invention.

Even at the trial defendants made no attempt to prove that this extraordinary industrial acceptance was due to advertising or was to be credited to anything other than the merit of the invention. Nor could they. This is not merchandise sold to housewives. The manufacturing concerns who took licenses and invested their money in the installation for the new welding, did so because their expert operating men had passed on its merits as to speed, quality and economy (R. 408).

Some of the leading men in electric welding appeared at the trial and testified as to illustrative examples of the important applications of the Unionmelt welding process in industry. Their testimony was not disputed.

Those were the men who would have known whether the Jones *et al.* patent was a "regrant of the expired Lincoln, Robinoff and Miller patents." Defendants' failure to question any of these men about Robinoff or Lincoln or Miller is most significant.

This country most desperately needed ships when war broke out in Europe and when the battle of the Atlantic was being fought. Altogether 5,000 or more ships were built for the Maritime Commission—and all yards building ships for the Maritime Commission used the Unionmelt welding process (R. 366). A welding operator using the Unionmelt process turned out approximately six times as much weld as a hand welder (R. 362). A Unionmelt operator could be "more easily trained and older men, because it is a much easier job." (R. 362) Leigh R. Sanford, the Director of Construction for the Maritime Commission, appeared at the trial and testified as to the importance of the Unionmelt welding process (R. 364).

In one of the great shipyards of the country, that of the Sun Shipbuilding and Dry Dock Company at Chester, Pa., the new method of welding made it possible to reduce the time a ship was on the ways down to 3 months, as compared with the 10 to 12 months which was previously required (R. 359). This was one of the highlights of the testimony of T. M. Jackson, a charter member of the American Welding Society and author of its chapter on "Submerged Melt Welding." (R. 356)

Mr. Jackson is an outstanding figure in electric welding, and the facts are so startling that we should like to quote at some length om his testimony:

> "A. The biggest advantage we saw in this welding was that we were enabled to build very large sub-assemblies in our shop, and on those as compared with riveting, we did a very much quicker job with about one-sixth of the man-hours on the shop assemblies.
>
> "Also, the welding of them with the Unionmelt process was a major factor in keeping those subassemblies straight and more nearly to accurate dimensions, because in the Unionmelt process there was considerably less distortion on relatively thin plates and less shrinkage than with manual welding. That was a very important consideration.
>
> "These big subassemblies are a tank length long, about 40 feet long, and about 30 to 35 feet high, weighing up to 25 tons. They are transported out to the shipways and assembled on the shipways and the straighter they are and the less distortion and more accurate we can hold the dimensions, means additional great savings in the time required to assemble and fit these big, large subassemblies together prior to welding on the ways.
>
> "Q. You have mentioned distortion. I wish you would explain a little more specifically what distortion means.

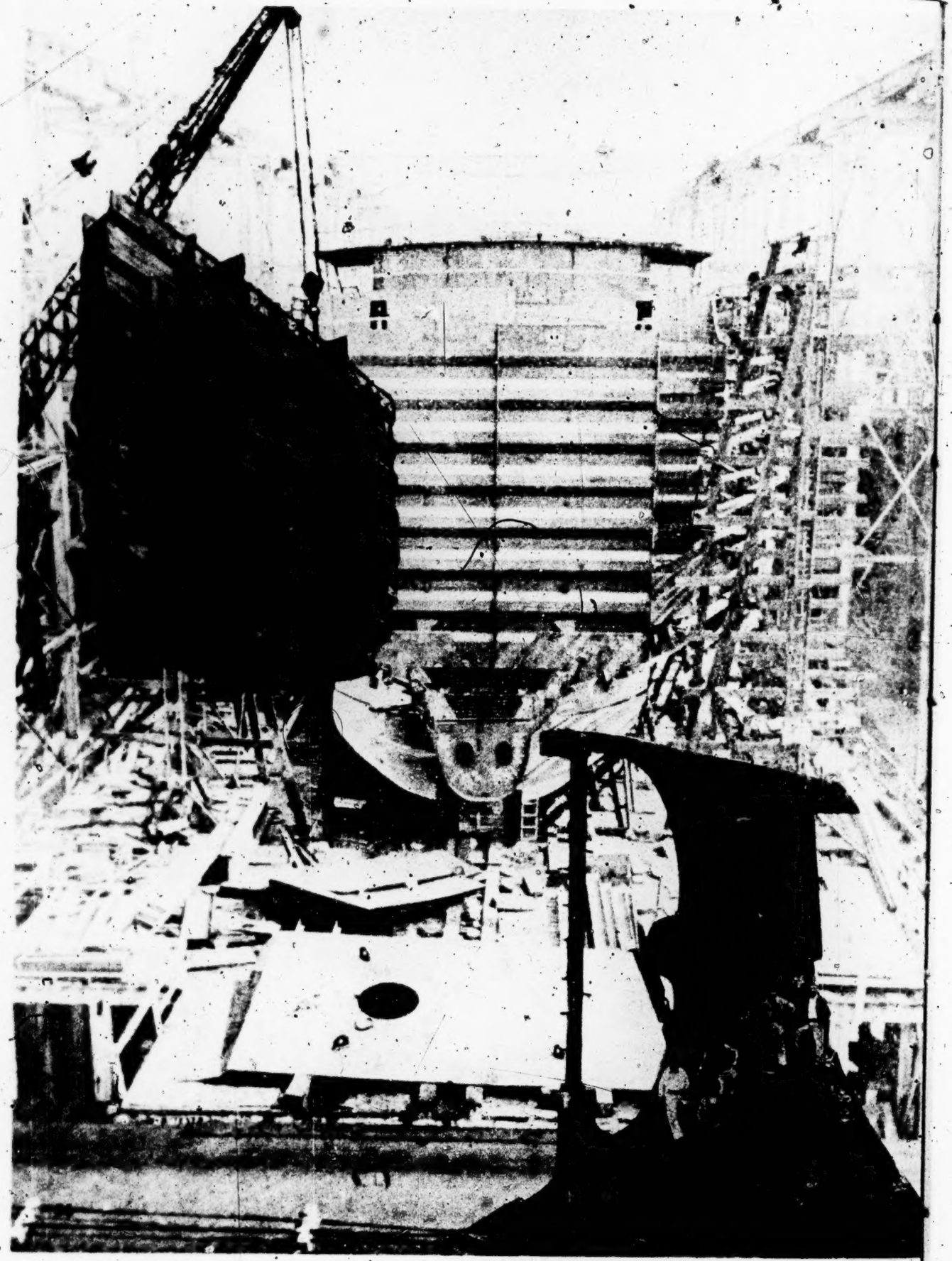

Fig. 4. *Welded Sub-assembly Going Into a Tanker*
(Pltf's Ex. 201, R. 360).

Large sub assembly was built in shop with Unionmelt welding process and transported and lowered into place on shipway. Elapsed time ship was under construction on shipway was reduced from 10 months to 3 months. Sun Shipbuilding and Dry Dock Company, Chester, Pa.

"A. I meant by distortion that when you weld a butt joint or any kind of a joint in a light plate, you get the plate wavy, it bends, and where it gets fitted into the ship it must be straightened out straight again.

"Q. Now, specifically, with regard to manual welding with a coated rod: Tell us about distortion in that connection?

"A. In manual welding with a coated rod, where you have to put a series of beads on, one on top of the other, each bead that you put on tends to add to the distortion, and also to add to the shrinkage.

"In the Unionmelt process, you get one pass on each side of the plate, a total of two passes, and it results in less distortion and less shrinkage.

"Q. Before the war production years, what was the elapsed time that a ship was on the ways?

"A. Ten to twelve months.

"Q. And was that time reduced?

"A. Yes, sir, during the war, with our latest method of welding in the shop, and erection, we reduced that to approximately three months.

"Q. And to what do you attribute that reduction in elapsed time?

"A. Very largely, to the welding, and very largely, to the speed with which we could make our largest ship subassemblies.

"Q. Now, I wish you would look at the photograph that I believe is on page 36 of this same book.

"A. Yes, sir.

"Q. I ask you if that fairly illustrates a subassembly going into a tanker?

"A. Yes, sir, that illustrates a transverse bulkhead." (R. 358-9)

Figure 4, which we have inserted in this brief, is the photograph mentioned in the above testimony (Pltf's Ex. 201, R. 360).

Anchor chain was an extremely critical item. At one time 19 Liberty ships ready to be delivered were held up solely for the lack of anchor chain; and ships were sent to sea with only one anchor chain when they normally carry two (R. 337, 368). Unionmelt was found to be the only welding process capable of welding high tensile bar steel 2 inches in diameter into anchor chain. This testimony was given by Robert S. Miller, President of Pacific Chain & Mfg. Company. His company used the Unionmelt process to produce $15,000,000 worth of anchor chain and was found on renegotiation to have the lowest cost in the industry (R. 335-9).

The Unionmelt process was adopted for welding the supercharger wheel in the turbo superchargers used in P-38, B-17 and B-29 planes. General Electric built a 28 million dollar plant for the production of these superchargers at Ft. Wayne, Indiana. The adoption of Unionmelt welding reduced the welding time down to five minutes compared with one and one-half hours, the best that could be accomplished with hand welding. Saving in cost amounted to approximately $5 a wheel and 1,000 to 1,200 wheels per week were manufactured. This was the testimony of J. P. Morrissey, Welding Engineer for General Electric at their Ft. Wayne plant (R. 378-383).

High pressure steam boilers require extremely high quality welding. So do the cracking stills in gasoline refineries, and other kinds of "pressure vessels." Licensees in the pressure vessel industry, such as A. O. Smith Corporation, Babcock & Wilcox, M. W. Kellogg Company and C. F. Braun Company, made extensive use of the Unionmelt process (R. 397).

The bed plate for large Diesel locomotives was welded by Electro Motive Company. It was 4½ inches thick and was welded in two passes, one from each side (R. 390-1).

Large bombs with a wall thickness of 5 inches were welded with the Unionmelt process (R. 398).

Much pipe used for irrigation is made on spiral pipe machines, where a flat band of steel is shaped and welded in a continuous process to form pipe with a spiral seam. The older welding process limited the speed to 20 inches of pipe per minute. With the Unionmelt process the speed was increased to 120 inches per minute with great improvement in quality. Thus the Unionmelt process greatly increased the output without any increase in plant investment (R. 395-6).

These are but a few illustrations of the scope and variety of the applications of the Unionmelt process—and little wonder is it that this new welding cut considerably into Lincoln's entrenched position (R. 467-8).

The Patented Welding Process.

The Jones *et al.* patent is reproduced in full at R. 955-60 and extra copies will be supplied for convenient reference. We trust that the Court will make use of the full text of the patent, rather than the incomplete and inadequate "excerpts" annexed as the Appendix to the Petitioners' Brief.

The patent in suit disclosed and claimed a process or method of electric welding, as well as compositions of material to be used in this process.

Both the Trial Court and the Court of Appeals found that Jones *et al.* had discovered "a new process of welding", as well as compositions for use in that process (R. 907, 913; Finding No. 7, R. 924; R. 997).

The process is focused in the welding zone, in the area around the tip of the rod where the rod and plate edges are melted and fused, i.e., welded (Opinion, R. 911).

The Court of Appeals said in its Opinion:

> "Plaintiff's process was quite different from that of the prior art disclosures in that the latter depended on the evolution of more gas to protect the molten metal, while plaintiff's proceeds on the theory of eliminating all gas forming ingredients. That difference is clearly one of process. True, plaintiff's process contemplated and depended upon a different composition of flux, and the patent was issued on both process and flux composition, and we think rightly so." (R. 1002)

The patent directs (p. 3, col. 1, ll. 35-6, R. 957) that the plates to be welded be "arranged as for metal open arc welding" and with their edges "preferably beveled." The groove is filled with the granular welding composition "and a substantial additional quantity of the composition is heaped up along the groove," overfilling it (p. 2, col. 1, ll. 45-51, R. 957). The bare metal welding rod is inserted into the heap of welding composition, or "melt." (p. 2, col. 1, ll. 64-67, R. 957)

The melt is non-conductive when cold; and something must be done to provide a conductive path for the electric current to get the process started. This may be done with a starting wad of steel wool, or by drawing an initial airborne arc, or otherwise (p. 3, col. 1, ll. 67 *et seq.*, R. 957).

We are now ready to start welding, and the teaching of the patent continues as follows:

> "The power is then applied, the welding composition is locally heated until it fuses and becomes conductive, forming a subsurface pool, and immediately thereafter the end of the electrode begins to fuse and the molten metal begins to deposit in the groove, displacing the subsurface pool of fused welding composition. At the same time the edges of the objects

> being welded begin to fuse and to coalesce with the deposited metal. The electrode is then fed toward the work and moved along the seam at an appropriate rate, * * *" (p. 3, col. 1, ll. 72 *et seq.*, R. 957)

All that can be seen externally is the welding rod plowing along through the quiet ridge of granular melt. The Trial Court referred to the "blinding glare", the "constant flashings" and the "great amount of smoke and splatter" which characterized the prior methods of electric welding, and then stated:

> "* * * in contrast to the appearances of those methods, there is no glare, no open arc, no splatter, and very little, if any, smoke in the Jones, *et al.* method." (Opinion, R. 907)

The contrast in operating performance is even more phenomenal, and of much greater importance. Again turning to the Trial Court's opinion (R. 907):

> "The truly remarkable difference, however, between what Jones, Kennedy and Rotermund invented and what had gone on before is perhaps best manifested by the performance achievements of their invention."

What Takes Place Under the Flux Blanket:

The contrast in appearance is easy to see. Equally manifest is the advance in operating capabilities.

But it is not so easy to describe the difference in what takes place in the welding zone.

The welding process is what takes place in the welding zone, where the tip of the rod and the plate edges are melted and the molten metal is deposited as the weld metal.

Even to take a stick and rake aside some of the granular material and expose the mantle of molten flux will cause some fireworks; and any rupture in that mantle necessarily means a radical change in the welding action, with ensuing porosity, and thus it is not possible to open up the arc zone for direct observation (R. 157).

Dr. Doan, the welding expert called by the Linde Company, had carried on a great deal of experimental work to study the welding action. He testified at length on that subject (R. 156-161).

Figure 5, which we have inserted in this brief, is a diagrammatic picture of the welding action and is taken from Dr. Doan's chart (Pltf's Ex. 167, off. R. 156, rep. R. 887). This diagrammatic picture shows the pool of fused melt, and also shows the welding rod which projects down into the heap of granular melt, with the tip of the rod in contact with the underlying pool of fused melt.

The written text on Dr. Doan's chart and Dr. Doan's testimony at the trial explain the welding action which takes place in the Jones *et al.* patented process, as follows:

> The pool of fused melt cloaks and protects the weld as it is being made. The white-hot molten steel is never exposed to the air and cannot oxidize (R. 177). The tip of the steel rod is melting and so are the edges of the plate. This melted steel mixes with the fused melt. The steel sinks to the bottom and gradually freezes—the fused melt floats to the top and also solidifies—thus forming a layer of brittle, glossy slag which pops off at the slightest touch, leaving a bright, clean, sound weld (R. 153-156).
>
> All of this time the weld rod is plowing ahead—and the molten pool goes with it. Fresh granular melt and more steel are being fused at the leading edge of the pool, continually replenishing it, as the frozen steel and slag are left behind (R. 165).

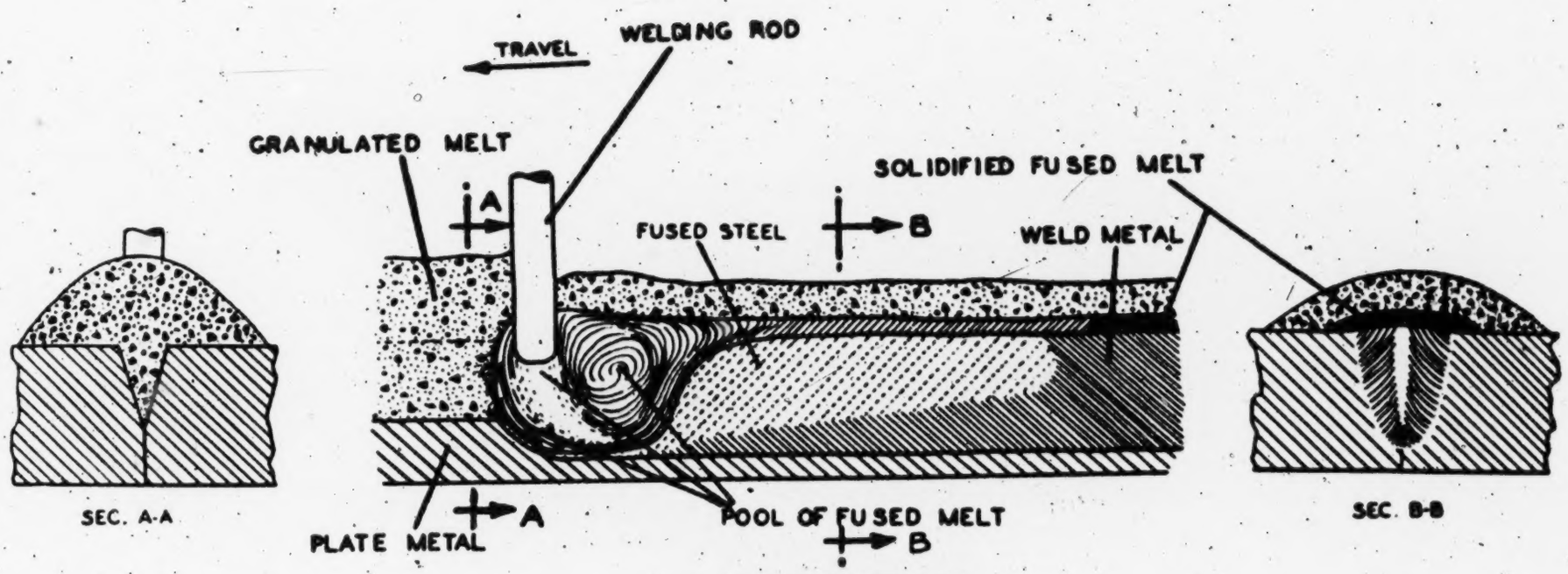

Fig. 5. Diagrammatic picture of the welding action in Jones *et al.* process, as shown on Dr. Doan's chart (Pltf's Ex. 167, R. 156, 887).

> The core of the pool is of low density, probably made up of a swirling mixture of melt vapor and mist mixed with iron vapor and mist (R. 155).
>
> All the electric current flowing between the rod and the plate passes through the pool of fused melt, generating the terrific heat required to melt the steel.
>
> The entire pool is ionized, that is, the molecules are broken up into ions and free electrons bearing the electric charges which make up the "current." (R. 154) The largest proportion of the current is borne by the more rapidly moving electrons in the core (R. 154).

It has not been possible to establish quantitatively what portion of the current flows between rod and plate through the liquid and what portion through the enclosed vapor core (R. 694, 806-7, 823).

But a substantial and important portion of the current does flow through the liquid. This is demonstrated by comparison of the two weld samples, Pltf's Ex. 172 A and 172 B (off. R. 176). These welds were made under identical conditions, except that the flux used in making one weld had a greater conductivity in its liquid phase than the flux used for the other weld (R. 825). The resulting difference in the width of the weld is significant. There is a wider melting of the steel in the case where more current was carried by the liquid (R. 170, 825; *cf.* Lincoln's chief engineer, Mr. Landis, on cross-examination, R. 377; also Lincoln's expert, Mr. Yeomans, R. 764).

This is not to be visualized as two separate and distinct paths, one through the vapor core and the other through the surrounding liquid, but rather as only one path for the conduction of the current. There is only one material and one medium, with a gradation in temperature (R. 153-5). Throughout the pool, both in its vaporous core and surrounding liquid mantle, the mechanism of current conduc-

tion is basically the same, viz.: "a progression of positive ions in one direction and of negative ions and electrons in the other." (Pltf's Ex. 190, off. R. 209, rep. R. 892).

A fuller explanation of what takes place under the blanket of granular material in the Unionmelt welding process may be found in Dr. Doan's treatise, "Conduction of Electric Current in an Ionized Gas or Liquid" (Pltf's Ex. 190, off. R. 229, rep. R. 889-892).

"Contact" Is the Key to the New Process.

Defendants have raised much furore about an arc. This is a man of straw.

The word "arc" means simply electric conduction in a vaporous or gaseous medium (Opinion, R. 911). The best evidence Dr. Doan could assemble indicated that there was a vapor core in the pool (R. 154, 184; and see Fig. 5 in this brief). Accordingly, at the trial, and here, we called the vapor core an "arc", although the Trial Court found it impossible to say with certainty whether or not an "arc" was present (Opinion, R. 909).

But nothing turns on the label employed.

Whatever it is, it is new. Gone is the old "open arc", or "air-conducted" or "gas-conducted" arc. There is no "arc of the usual type", as the patent puts it (p. 4, col. 1, l. 44, R. 958).

For the first time, the electric current between the rod and the plate is contained within a conductive mantle. The arc zone is entirely sealed in and shielded by that mantle; and the arc itself is composed of ionized welding composition in a vaporous state (R. 159; Opinion, R. 911).

As the Trial Court expresses it:

> "A new result ensues, to wit: an arc operating in different surroundings." (R. 913)
>
> "In bare rod welding, the dominant element in and around the arc is air. In covered rod welding, the fluxing material at least partially replaces the air. In the Robinoff clay flux method it is again the flux which at least partially replaces the air. In the Jones, *et al.* method, it appears that the vaporized area of ionization constituting the arc zone is entirely blanketed and shielded by a mantle of fused welding composition. It also appears that the arc area within this mantle is composed predominately of vaporous welding composition." (R. 911)

And whatever you call the vapor core, it operates without any sound or visible manifestation, whereas an open arc carrying the same amount of current would be a most awe-inspiring thing (R. 187, 199).

The inventors found it impossible to open up the arc zone and directly observe the welding action—and thus could not state with certainty the electrical phenomenon contained within the pool (R. 63, 120).

What did they set forth in their patent as the criterion or key element which differentiates their new process from all of the prior art?

They used the observable fact of "contact" between the welding rod and the pool of fused melt, the continuous immersion of the tip of the electrode in the fused pool, as the key to this process. That is the common denominator of the process claims. Yet defendants, in selecting the "excerpts" to annex to their brief, omitted virtually all of the many references to "contact" in the process claims.

The Trial Court's statement of the true meaning of "contact" was as follows:

> "What does seem evident is that the welding rod somewhere above its very end is in contact with, or rather is surrounded by, the pool of fused flux and that the arc zone, the vaporous ionized area between the end of the electrode and base metal, is sealed in by a sheath of molten flux * * *." (R. 911)

That is the set-up which is pictured in the charts of our welding expert, Dr. Doan, which show the mechanism of the process (Pltf's Exs. 167 and 173, off. 156, 188 rep. R. 887 and 888). Plaintiff's Exhibit 173 was referred to by the Trial Court (R. 911). It is also what the patent itself clearly intends.

Defendants have made no attempt to suggest that any prior art process accomplished such "contact." All are characterized by a blazing, visible, open arc between rod and plate (Opinion, R. 907).

The fact of "contact" was conclusively established by the extended and detailed testimony of Dr. Doan with respect to many tests he conducted (R. 156-161, 184-94). The tests were made with Unionmelt and were duplicated with Lincolnweld 660 flux (R. 189). They could not be duplicated with the clay flux or other prior art processes (R. 770).

One elaborate series of experiments was made in a large tank in which a high vacuum was maintained (R. 184-5). Pictures of this apparatus are printed as plaintiff's exhibits 175 A-C, R. 1136 A-C (off. R. 188). It is not possible to weld in a high vacuum with the Robinoff clay flux or any other open arc process, but Dr. Doan found that he could weld with the patented process, using either Unionmelt or Lincolnweld flux (R. 186). This clearly established the accuracy of the patent's statement that the arc existing in the new process is not an "arc of the usual type"—not an "air-conducted" or "gas-conducted" arc.

High speed motion pictures in color, made under Dr. Doan's direction, and taken at more than fifty times the normal speed, specifically showed contact between the welding rod and the large pool of molten flux—both with Unionmelt and with Lincolnweld flux (Pltf's Ex. 171, off. R. 167; R. 164-8).

Plaintiff's Exhibit 169.

Perhaps the most graphic evidence that "contact" is the key to the quality and performance capabilities of the new process is to be found in Plaintiff's Exhibit 169 (off. R. 176).

Figure 6, which is folded in at the end of the Brief, is a photograph of this exhibit. This shows a long weld that has been sliced open lengthwise. The left portion is a disfigured mass of holes and pock marks—an extreme case of "porosity."

But near the center of the specimen the weld deposit changes abruptly—not gradually, but abruptly—to a clean, sound weld of full depth. And it continues that way to the right-hand end.

This is no gradual transition or mere change in degree. It is a change in kind.

The abrupt change in weld structure resulted from a change in the welding action or process at that point (R. 160).

Now this is the way that weld was made: Dr. Doan laid along this seam a tapered layer of Lincolnweld 660 flux, that is, he began with no flux at all at the left end and gradually increased the depth. Then he started welding with an open arc at the left end (R. 159-160, 199). He observed the rod as it progressed along the seam and encountered an increasingly greater depth of flux. As long as the flux was shallow enough for the open arc to persist,

the weld was ruinously porous. But when the rod or electrode reached a point "near midway of the plate" he observed "that the flux tide closed in and sealed the electrode." (R. 160)

Now if this were like any of the older fluxes used with open arcs, there would be a gradual improvement up to a point; that is, the porosity would grow less though not disappear. But here the weld remains very bad up to the mid-point and then abruptly changes to a sound weld. As Dr. Doan stated, "the surface is considerably porous until the electrode is immersed in the pool, and after that you get a sound weld." (R. 160)

Thus it was "contact" that made the difference.

The Patented Welding Composition.

The invention in suit constituted a twofold achievement.

One of the first things that the inventors discovered was that the very materials recommended by the prior art as welding fluxes—such as borax, sodium carbonate and Robinoff's iron oxide—were not capable of serving as welding compositions in their new process (R. 38). This forced them to develop a brand new welding composition which would operate in the desired manner.

Their success was acknowledged by both lower courts. Both determined that the invention in suit included new compositions of material for use in the Jones *et al.* process (Finding No. 7, R. 924; R. 1002).

The welding composition is a specially prepared prefused material, ground to the proper particle size and used in granular form (R. 264). It never existed prior to this invention and no evidence has been presented that it has any other known use in industry.

The patent states that:

> "The physical condition of the welding composition is likewise of the utmost importance."

and gives explicit directions for manufacture so that

> "substantially all of the solidified welding composition is characterized by a vitreous fracture." (p. 3, col. 1, ll. 32-3, R. 957)

Large portions of the patent specifications are given over to its discussion, and detailed directions are given as to its constituents, and its physical and chemical characteristics and properties, and its mode of preparation (p. 2, *et seq.*, R. 956; see also R. 255-6).

In selecting the "excerpts from specification describing conductive melt process of patent in suit" and their excerpts describing the composition of the patent, annexed as an Appendix to Petitioners' Brief, they have emasculated the specifications and have omitted many important portions. One important omission is the statement of the mandatory requirements, the five "musts" wherein the inventors summarized their detailed directions in the following unequivocal language (p. 2, col. 1, ll. 38, *et seq.*, R. 956):

> "A large number of experimental welds which we have made support the conclusion that the properties of a successful welding composition for this method of welding are these:
>
> "(1) The chemical reactions between the components of the welding composition must be completed before it is used in welding. Failure in this regard most surely invites porosity.
>
> "(2) It must be capable of controlling the penetration and the width of the weld.
>
> "(3) Its fluidity at welding temperatures must be such that it will not become entrained with the molten metal.
>
> "(4) It must consist of chemicals which are not detrimental to the properties of the steel, and
>
> "(5) It must be readily removable from the finished weld."

Dr. Willard, plaintiff's chemical expert, testified that "the disclosures of this patent are unusually complete." (R. 255)

The patent specifically identifies nine metals which can be used to form the silicate:

> "We have used calcium silicate and silicates of sodium, barium, iron, manganese, cobalt, magnesium, nickel and aluminum, both in binary and ternary combinations, in various proportions." (p. 2, col. 1, ll. 62-65; R. 956)

We have underscored calcium, manganese and magnesium, since the preference of the inventors and of the Linde Company was primarily for calcium and magnesium, and the Lincoln Company used manganese (R. 42, 256-7). Calcium and magnesium silicates are much cheaper than manganese silicates. Kennedy testified:

> "* * * calcium and magnesium are available all over the world, so our preference was naturally for the cheapest flux." (R. 126)

The steps in the manufacture of the patented composition are graphically illustrated by the "Explanatory Chart for the Chemistry of Welding Compositions", which was prepared by plaintiff's chemical expert, Dr. Hobart Willard (Plff's Ex. 193, off. R. 333, rep. R. 895).

At the bottom of that chart are three bottles of welding composition. One is the Linde company's Unionmelt Grade 20, the preferred composition of the patent. The second is Linde's Unionmelt Grade 90, a manganese type of composition (R. 256-7). And the third is the infringing Lincolnweld 660 flux, also a manganese type of composition (R. 256-7).

Up at the top of the chart, in the top row, are indicated various chemical elements which are combined in successive steps as we proceed down the chart step by step.

There are three main paths, indicated by arrow lines.

The main constituent of the composition is a metallic silicate. This silicate is formed by melting together a "basic" metallic oxide and silica which is an "acidic" oxide. ("Basic" means alkaline, or the opposite of "acidic.") In practice, this is done in an electric furnace (R. 828).

The particular one of these three welding compositions we come out with at the bottom depends simply upon which "basic metallic oxides" we start out with up in the top row (R. 264-5). In each case the acid constituent (silica) is the same; and the halide salt (calcium fluoride) is the same; the alumina is present; stoichiometric proportions are used; and the material is prefused and prepared for use in granular form (R. 264).

The four basic metallic oxides shown in the top row (and five others which do not enter into the present case) are expressly enumerated in the patent (R. 265).

If we start with calcium oxide, magnesium oxide and a small amount of aluminum oxide, we come out with Unionmelt Grade 20 (R. 264).

If we start with a predominant amount of manganese oxide, we come out with Unionmelt Grade 90 or with the accused Lincolnweld 660 flux (R. 264).

To that main constituent, the metallic silicate, is added a minor proportion of a so-called halide salt. Calcium fluoride is the particular halide salt used in all these compositions.

After the composition is fused in the electric furnace, it is chilled, and the final product ground to proper size of granules (R. 264).

The Infringing Lincolnweld 660 Flux.

The accused welding composition is called "Lincolnweld 660 flux." The Trial Court compared the accused composition and the patented composition as follows:

> "The two compositions are identical in operation, and the same kind of weld is produced by them. The mechanical methods in which these compositions are employed are essentially similar. A fair construction of the evidence is that Lincolnweld 660 flux can be substituted for Unionmelt Grade 20 without any change in operation or result except that Lincolnweld composition induces a greater amount of manganese into the weld metal." (Opinion, R. 919)

Lincolnweld 660 flux was used by all defendants at the plant of the defendant Graver Companies in East Chicago, Indiana, within the Northern District of Indiana (Finding No. 18, R. 926).

> "The accused Lincolnweld 660 flux is a calcium manganese aluminum silicate with calcium fluoride added * * *." (Finding No. 21, R. 926)

Thus it is the same type of composition as grade 90 Unionmelt which the Linde Company placed on the market two years prior to the introduction of Lincolnweld (R. 257, 345, 471, 834-5, 840).

This "calcium manganese aluminum silicate with calcium fluoride added" is also to be compared with the calcium magnesium aluminum silicate with calcium fluoride added, which is the "preferred" composition of the patent and which plaintiff sells as its Unionmelt Grade 20 (R. 257; Opinion, R. 919).

Calcium and magnesium are alkaline earth metals. Manganese is not. (See Findings Nos. 11 and 12; R. 925.)

That posed an issue which the Trial Court and the Court of Appeals both decided in favor of the plaintiff. It is discussed under Point III, pages 57 *et seq.*, below.

ARGUMENT.

Summary of Argument.

Point I. We will mention salient and undisputed facts of a non-technical nature, which place a heavy burden on the Lincoln Electric Company and other petitioners in this Court. The findings of the Trial Court, made after a three weeks' trial, were in favor of the Linde Company on all fundamental questions of invention, anticipation and infringement.

Point II. We have here a most dramatic exemplification of originality and invention. Previously all progress in the art of electric welding had been through the evolution of more and more gas to protect the molten steel. Our inventors had the vision to see that gas caused the pinholes or porosity in Robinoff welds—and the courage to develop a process which eliminated all gas forming ingredients. No prior art flux can be used in this process, nor can the new flux be used in old open arc welding.

Point III. The Trial Court found that Lincolnweld 660 flux and the patented composition are "substantially identical in operation and result." Furthermore, Lincolnweld 660 flux was prepared step by step in accordance with the teachings of the patent. It differed from the preferred composition of the patent in a single particular—manganese oxide was substituted for magnesium and calcium oxides as the basic constituent of the major salt and such substi

tution was expressly taught by the patent as an optional composition.

Point IV. Here we come to the difference between the Trial Court and the Court of Appeals on principles of claim construction. This point will discuss the nine process claims which the Trial Court said "import" an erroneous scientific theory. We will show that these nine claims accurately state the scientific theory. Furthermore, scientific theory is surplusage in a patent.

Point V. Claim 27, a composition claim, does not "import" anything as to the scientific theory of the process.

Point VI. Here we will discuss the six process claims which the Trial Court held to lack the particularity and distinctness required by the statute. These claims are to be read in the light of the specifications which describe at length the distinctive properties and characteristics required for the new welding.

Point VII. Three claims use the generic terms "silicate" and "metallic silicate," and thus denote the nine metallic silicates which had been proved operative by the inventors.

Point VIII. The Trial Court found that the licensees under the patent were free to buy any materials or equipment from the Linde Company or any other source. No evidence was offered of any "tying agreement" or other misuse of the patent.

Appendix A will give an illustrative sampling of statements made in Lincoln's brief which find no support in the record and which are not in accordance with the facts.

POINT I.

Both Lower Courts Determined All Fact Issues as to Invention, Anticipation, Disclosure and Infringement in Favor of Plaintiff.

These Findings Are Fully Supported by Extended Oral Testimony, Welding Demonstrations, and Motion Pictures.

They Establish the Great Merit of the Jones *et al.* Invention.

The decisions below have placed a heavy burden on The Lincoln Electric Company and other defendants.

They deliberately infringed the Jones *et al.* patent by exactly copying the invention disclosed therein (Findings Nos. 21, 22, R. 926). They produced virtually no evidence at the trial to support or justify their actions.

Plaintiff, on the other hand, went forward and submitted extensive evidence on every factual element of invention, patentability and infringement.

Much of this evidence was highly technical. But there was plenty of non-technical proof. And the Trial Court referred to the evidence as "clear and convincing." (R. 907)

Here are some of the salient and undisputed facts of a non-technical nature:

First: The simplest fact is the radical difference in outward appearance. (Opinions, R. 907, 996). Instead of a terrifying open arc, there is a quiet layer of granular material with no visible manifestation of the welding action (Opinion, R. 907).

Second: The performance capabilities of the new invention represented a revolutionary advance in the welding art.

With the new invention it was possible to weld plates 2½ inches thick in a single pass and to employ currents 3,000 amperes and above. It was also possible to attain speeds of 120 inches or more per minute on thin plate. And to produce welds of the highest quality (Finding No. 8, R. 924-5).

Third: All the prior art was available to The Lincoln Electric Company, which had for many years held a dominating position in electric welding (R. 410, 436-7, 449, 471). Yet that company could not even approach the above accomplishments until it introduced the accused Lincolnweld composition and process in 1942.

In their own catalog announcing Lincolnweld they say it "boosts production 800%." (Pltf's Ex. 203, at p. 13, off. 369)

Fourth: American industry promptly adopted the Jones *et al.* invention and used it extensively (R. 389-93, 394-5). The acquiescence of industry in the validity of the patent was practically universal. Many companies well advised by engineering and legal staffs took licenses (R. 397-8).

We have mentioned above, at page 25, the independent witnesses who testified to the scope and variety of the applications of this new welding, and the great benefits obtained.

Harry Kennedy, one of the inventors, testified as to their experimental tests and other matters. He was cross-examined at length by defendants' counsel. Lloyd T. Jones also was a witness at the trial. The qualifications of these two are mentioned above at page 12.

We also called plaintiff's Vice President, R. E. Cornwell, who has had charge of the commercial development of the Jones *et al.* welding invention for the Linde Company since they first negotiated with the inventors (R. 385-6, 415), and other officials of the plaintiff and affiliates having firsthand

knowledge of the facts (Supp. R. 161-4, 841-50; Brennan, R. 827-40).

Gilbert E. Doan, head of the Department of Metallurgical Engineering at Lehigh University, was our welding expert. He has devoted his time to welding engineering and research since 1919. His qualifications appear at R. 141-2.

Hobart H. Willard, our chemical expert, has taught chemistry at the University of Michigan since 1909 and has been in charge of the Department of Quantitative Analysis (R. 255).

Walter T. Fishleigh was our patent expert. His qualifications appear at R. 340-3. His charts are in evidence as Plaintiff's Exhibits 204 and 236 (off. R. 372, 854; Ex. 236 distribution as supplement to record).

In preparation for the trial Dr. Doan conducted a large number of tests with various welding processes extending over a period of six months or more (R. 782). Mr. Fishleigh participated with Dr. Doan in the test work, and also made trips to industrial plants where he observed Unionmelt welding and Lincolnweld welding (R. 344). Dr. Willard in preparation for the trial witnessed many welding tests at the Linde research laboratories in Niagara Falls (R. 255).

The elaborate series of experiments made in the large tank, and the high speed motion pictures in full color, both of which have been mentioned above, page 36, will give some idea of the study devoted to this matter by Linde's experts who testified at the trial.

In sharp contrast was the fact that Lincoln's expert witnesses did virtually nothing to acquaint themselves with this invention. Mr. Yeomans had performed no experiments and had not tried by any means to verify the opinions he expressed and the first time he ever saw the Unionmelt

welding process was in the demonstration which the Linde Company gave during the course of the trial (R. 741, 744, 746). He was a machinist by trade and had no formal education after the age of 14 (R. 699, 743).

Dr. Nusbaum, another expert witness called by Lincoln, had specialized in the X-ray field and had never seen the Unionmelt process prior to the trial. His only experience with welding consisted of two visits to The Lincoln Electric Company, where he spent "perhaps one-half hour on the first occasion; perhaps an hour on the second." (R. 605-6)

The Trial Court had the opportunity to appraise the experts and other witnesses. He followed their testimony closely, step by step, as it was given.

The Trial Judge made trips to plant laboratories during the three weeks' trial where he observed actual demonstrations of Jones *et al.* welding and the infringing Lincolnweld and prior art electric welding (R. 94-106, 207-14).

The Trial Judge also viewed hundreds of feet of motion pictures of various welding operations and tests, as well as the high speed motion pictures in full color of Unionmelt welding and Lincolnweld welding and the Robinoff process (Plff's Exs. 171, 180, 181 A-B, off. R. 167, 193, 203).

On the basis of this evidence the Trial Court drafted its opinion and its own findings covering practically all of the factual issues.

The Court of Appeals reviewed those findings and sustained them in every particular.

Rule 52(a) of the Federal Rules of Civil Procedure, adopted by this Court, provides:

> "Findings of fact shall not be set aside unless clearly erroneous, and due regard shall be given to the opportunity of the trial court to judge of the credibility of the witnesses."

This rule embodies a sound principle in the administration of justice, and has been applied many times in upholding questioned findings.

Adamson v. *Gilliland*, 242 U. S. 350, 353 (1917);
Davis v. *Schwartz*, 155 U. S. 631 (1895).

Moreover, it is the established rule in this Court that findings concurred in by two courts below will not be disturbed unless they are without support. *Alabama Power Co.* v. *Ickes*, 302 U. S. 464, 477 (1938); *General Talking Pictures Corp.* v. *Western Electric Co.*, 304 U. S. 175, 178 (1938).

Our oral testimony covered every factual element of the case and in most respects was uncontradicted.

In view of the salient non-technical facts set forth above, we believe it appropriate to quote the statement of Mr. Chief Justice Marshall in *Grant* v. *Raymond*, 6 Pet. 218, 242 (U. S. 1832), with reference to the constitutional policy embodied in our patent laws:

> "The laws which are passed to give effect to this purpose ought, we think, to be construed in the spirit in which they have been made; and to execute the contract fairly on the part of the United States, where the full benefit has been actually received; if this can be done, without transcending the intention of the statute, or countenancing acts which are fraudulent, or may prove mischievous. The public yields nothing which it has not agreed to yield; it receives all which it has contracted to receive."

A restricted construction is especially out of order where, as in this case, the invention has had great practical success. Thus, as stated by Mr. Justice Stone in *Smith* v. *Snow*, 294 U. S. 1, 14 (1935):

> "If the matter were doubtful, it is plain from what has been said that the character of the patent and its

commercial and practical success are such as to entitle the inventor to broad claims and to a liberal construction of those which he has made."

In Answer to Pages 68-69 of Petitioners' Brief—"Decision of Court of Appeals Is Result of Miscarriage in Review Procedure—Unreversed Findings Have Been Displaced by Mistaken Rules of Law."

The Petitioner's Brief does not openly or avowedly attack any finding of fact, nor deny that the findings are amply supported by the evidence. Instead they merely pretend that most of the findings of fact made by the Trial Court were in favor of defendants and that the Court of Appeals has ignored some of those findings, and, as to others, has substituted erroneous legal conclusions.

In attacking the Court of Appeals for this alleged "miscarriage in review procedure" defendants do not quote any part of the findings. In fact, under this point in their brief, there is not a single reference or citation of any kind. The reason is simple—nowhere can they find any support for their attack on the Court of Appeals.

After the District Court entered judgment, both sides took appeals and both filed statements of the points to be urged on the appeals.

In the "Statement of Points by Defendants-Appellants" printed at R. 936-941, they said that "defendants-appellants assert and intend to urge on their appeal" that the District Court erred in making Findings Nos. 10, 13, 14, 20, 21, 22, 23, 24, 25 and 28; and they further said that they asserted and intended to urge that the District Court erred in rejecting 22 paragraphs of the proposed findings of fact submitted by defendants. Many of those proposed findings which were rejected by the District Court nevertheless appear in argumentative form in Petitioners' Brief.

The Court of Appeals, in rejecting defendants' appeal, did not ignore the Trial Court's findings. On the contrary, those findings are succinctly summarized in the opinion of the Court of Appeals (R. 997-8, 1002-3).

The statement of points for the plaintiff, which we filed at the same time, is printed at R. 932. That statement shows we did not question a single finding of fact of the District Court. The Court of Appeals in upholding our appeal did not upset a single finding of fact.

This portion of Petitioners' Brief is sheer nonsense. When defendants filed the statement of points to be urged on their appeal, they were still in contact with reality. But now, when they have a point so headed without a single citation, they are desperately trying to get away from the facts.

POINT II.

The Jones *et al.* Welding Proceeds on the Basis of Eliminating All Gas-Forming Ingredients—the Very Antithesis of All Prior Art Welding.

To Have the Vision and Courage to Go Directly Contrary to the Teachings of the Prior Art, and to Succeed, Is the Most Dramatic Exemplification of Inventive Genius.

In this case we do not have to speculate about the hypothetical worker "skilled in the art." James Finney Lincoln and his welding engineers were able to dominate the welding industry but were not able to achieve in any degree this great advance in the art, as Mr. Lincoln was forced to admit on his cross-examination (R. 466). More specifically, Western Pipe & Steel Company before calling on Jones and his colleagues, sought help from two other experts, Lester and Strobel, and they were not able to do

anything to eliminate the porosity (R. 32; 138; Pltf's Ex. 128, off. R. 31, rep. R. 879). Robinoff himself at the trial had to admit that he still did not know what caused the porosity.

Robinoff and the other prior art processes all had depended on the evolution of more and more gas to protect the weld (Finding No. 6, R. 924). Jones *et al.* eliminated entirely all gas-forming ingredients—the very antithesis of prior art welding (Finding No. 6, R. 924).

To have the vision and the courage to proceed directly contrary to the teachings of the prior art—and to succeed—is the most dramatic exemplification of originality and inventive genius.

The District Court and the Court of Appeals have both unanimously held in favor of the inventors on the fundamental point of invention. On this point defendants cannot offer any facts and are remitted entirely to contentious argument. They say:

> "The result of what the Court of Appeals has done is to regrant to respondent Linde the expired Lincoln, Robinoff, and Miller patents." (Petitioners' Brief, p. 4).

With respect to a similar contention, relating to an earlier invention in the welding field, Judge Hough said that either the story was false, or it necessarily implied "remarkable stupidity" on the part of those who practiced the prior art. *Elyria Iron & Steel Co.* v. *Mohegan Tube Co.*, 7 F. 2d 827, 829 (C. C. A. 2d 1925).

Here, to accept defendants' thesis, one must suppose the art was so "remarkably stupid" that it struggled along for years with old arc welding that would yield but an $\frac{1}{8}$-inch bead of good quality metal per pass, tolerating a current of 300 amperes at the most (R. 177), that would yield even

passable welds for any purpose of no more than $\frac{3}{8}$ inch and with a current of 700 amperes (R. 99), and with the operator crouched behind a cumbersome shield to guard him from the blinding arc glare (R. 175, 177).

Yet all the while, defendants would have this Court believe, the industry had only to look to the Lincoln, Robinoff and Miller patents to find out how to weld plates $2\frac{1}{2}$ inches thick at a single pass, to employ electric currents of 3,000 amperes and more on thick plate, to attain welding speeds of 120 inches or more per minute on thin plate, and all the while to produce welds of the highest quality (*cf.* Finding No. 8, R. 924-5).

Such argument scarcely flatters The Lincoln Electric Company, as long-time leader in the welding industry and professedly the "largest manufacturer of arc welding equipment in the world." (R. 410, 471)

And strange it is that, when the Lincoln Company in 1941 decided to bring out its Lincolnweld, they found it necessary specially to manufacture this flux (R. 665-6). The threat of this lawsuit, if nothing else, would have urged them to adopt some available product on the market, had such been possible, instead of making use of the Jones *et al.* patent.

No Prior Art Flux Can be Used in the New Process.

The inventors had to learn by the painful route of long and arduous research and experiment that the very things which the prior art recommended as welding fluxes would not serve in their new process.

For example, iron oxide, the only ingredient mentioned in the Robinoff patent (Defts' Ex. 103, off. R. 460, rep. R. 973, *et seq.*), had to be eliminated because of its gas generating properties (R. 38, 60-61); and so too borax and

sodium carbonate (R. 38), two of the favorite fluxes in the old Lincoln Patent No. 1,589,017 (Defts' Ex. 101, off. R. 458, rep. R. 961, *et seq.*).

Avoiding the evolution of gas was only one of the essential steps. The inventors had to produce a composition which, when fused, would maintain "contact" with the electrode (R. 41). No prior art flux known to them, nor any of the dozens relied upon by the defendants as prior art, would do that (R. 770).

Specifically, as to the Robinoff clay flux, Jones and his colleagues determined by experiment that it was almost impossible to prefuse it—and that, when prefused, it no longer gave off the protective gas required in the Robinoff process, and was of no use whatsoever in establishing the protective mantle of conductive melt in the Jones *et al.* process (Defts' Ex. 88, Flux No. 21, Test No. 138, off. R. 425, rep. R. 1155, 1206-7).

G. G. Landis, Chief Engineer of The Lincoln Electric Company, admitted on his deposition that not one of the many hundreds of different flux combinations theretofore used for electric arc welding, could be successfully used in the accused Lincolnweld process (R. 770). Defendants offered no evidence to the contrary.

Defendants had so little faith in the prior art patents that they did not examine any witnesses on them, either at the trial or during the extended pre-trial proceedings, except Robinoff, who testified as to his own patent.

Defendants' only witness who even referred to the prior patents was Mr. Yeomans. He contented himself with simply reading excerpts from those patents (R. 728-39). He had made no attempt to test the fluxes (R. 749) and was not surprised to learn that "none of them would make a satisfactory weld." (R. 749)

Many courts have refused even to consider prior patents on a technical subject matter when introduced without any explanatory testimony. See *Bell* v. *MacKinnon*, 149 Fed. 205 (C. C. A. 2d 1906); *General Electric Co.* v. *Germania Electric Lamp Co.*, 174 Fed. 1013, 1015 (C. C. D. N. J. 1909), and authorities there gathered; see also, *Williamson* v. *Electric Service Supplies Co.*, 236 Fed. 353, 354 (E. D. Pa. 1916), *aff'd*, 242 Fed. 873 (C. C. A. 3d 1917).

On the other hand, in plaintiff's rebuttal case, our expert, Mr. Fishleigh, covered each prior art patent in meticulous detail. He and Dr. Doan had made more than 170 tests to determine the possibility of substituting these prior art fluxes for the compositions of the patent. These tests in every instance, including Miller and all the others, showed a failure of the prior art flux (R. 854). This material is detailed in Mr. Fishleigh's book of charts, Plaintiff's Exhibit 236 (off. R. 845, distributed as supplement to record).

Nor Can the New Composition be Used in Old Open-Arc Welding.

Conversely, it is impossible to use Unionmelt or Lincolnweld 660 flux as substitutes for the prior art fluxes in following open arc welding practice. In Kennedy's words (R. 41),

> "I can conceive of no worse material to use with an open arc or an arc of the usual type than our flux."

The same thing is true of Lincolnweld 660 flux as shown by Plaintiff's Exhibit 169 (see Fig. 6 folded in at end of this Brief and p. 37 above).

Thus the patented welding composition is so different from prior art fluxes that the two are not interchangeable for any purpose.

The Lincoln, Robinoff and Miller Patents.

Defendants repeat time and again that the Jones *et al.* patent is a "regrant" of the "expired Lincoln, Robinoff and Miller patents," *e.g.*, p. 4.

So just a word at this point as to those three patents:

The Lincoln patent was so little regarded below that it was not mentioned anywhere in the findings or opinion of the Trial Court or the opinion of the Court of Appeals. Defendants themselves did not mention this patent, owned by The Lincoln Electric Company, in their Statement of Points which they said they intended to urge on this appeal (R. 936-44). The Lincoln patent was a "gas" patent.

As to the Robinoff patent, James Finney Lincoln himself described it as a "detail patent" of very little importance (R. 477)—and Lincoln did not even take a license under the Robinoff patent until May, 1945, three years after they had installed the infringing Lincolnweld process (R. 377, 578). The Trial Court of course made specific findings to the effect that Robinoff did not anticipate the Jones *et al.* patent (Finding No. 7, R. 924).

Also, as to the Miller patent, the Trial Court rejected the claim of anticipation. The Trial Court quoted (R. 920-921) from the Miller patent to show that the preferred form of the Miller patent was a coating containing acidic and basic constituents which would react during the welding operation—whereas the Jones *et al.* patent requires for its composition, that all reactions be completed before the composition is used for welding.

We will have more to say about these patents in Appendix A at pages xiv *et seq.*

POINT III.

The Lincolnweld 660 Flux Is Identical in Operation and Result With the Preferred Composition of the Patent.

The Lincolnweld 660 Flux Is Made in Complete Conformity With the Teachings of the Patent, Including Chemical Composition and Physical Properties.

The Defendants Themselves Used the Patent as Their Sole Source of Information in Compounding Their Flux.

The Trial Court's Holding of Infringement, Affirmed by the Court of Appeals, Was Correct.

Identity of Operation and Result.

The Trial Court's finding, expressly affirmed by the Court of Appeals (R. 1003), was that:

> "20. The accused Lincolnweld flux and the composition of the patent in suit are substantially identical in operation and in result." (R. 926)

That finding was based upon extensive testimony, and many demonstrations, exhibits and motion pictures.

Plaintiff's Demonstration No. 7 was particularly important in establishing infringement. The seam to be welded was divided into sections:

> The first section was welded with Unionmelt 20,
>
> The second with Lincolnweld 660 flux.

The welding rod travelled along quietly through the Unionmelt and on into the Lincolnweld 660 flux, without the

slightest suggestion of any difference or change in the welding process (R. 210-11).

Moreover, the completed weld (which is Pltf's Ex. 183, off. R. 212) showed no difference in surface appearance, in cross-section, or in structure of weld metal, between the Unionmelt part and the Lincolnweld part.

Other welding samples were made under identical conditions, one with Unionmelt and the other with Lincolnweld 660 flux (Pltf's Ex. 166, 177, off. R. 149, 192; R. 190-2). These also gave complete support to the Trial Court's findings. To the same effect was the testimony of Dr. Doan and Mr. Fishleigh (R. 189-206; Pltf's Ex. 204, off. R. 372).

Identity of Chemical Composition and Physical Properties.

This identity of operation and result follows naturally from the fact that the accused Lincolnweld flux was made in precise conformity with the teachings of the patent (Finding No. 22, R. 926).

The Trial Court's finding, again expressly affirmed by the Court of Appeals (R. 1003), was that:

> "A person skilled in the art can produce the accused Lincolnweld 660 flux by following the teaching of the patent in suit * * *." (R. 926)

The Courts below found not only that the accused flux can be produced by following the teachings of the patent, but that it was so produced by these very defendants (R. 920; Finding No. 22, R. 926; R. 1003).

The chemistry of the composition has been outlined above, pages 40-41.

In every respect, except one, the accused flux was identical with the preferred composition of the patent and there was literal infringement—that is,

Both used silica as the acid constituent of the major salt (Pltf's Ex. 194, off. R. 333, rep. R. 896).

Both contained basic ingredients in proportions required to combine with all of the silica present to form metasilicates (R. 295).

Both used calcium fluoride as the minor salt (R. 280; Finding No. 21, R. 926; Pltf's Ex. 194, R. 896).

Both were substantially free from uncombined iron oxide and from substances capable of evolving gases under welding conditions (R. 291).

Both were substantially anhydrous (R. 291).

Both contained alumina within the limits taught in the patent (R. 280; Finding No. 21, R. 926).

Both were characterized by a vitreous fracture (R. 291-2).

Both were manufactured in accordance with the detailed teachings of the patent (Finding No. 22, R. 926).

Thus the accused flux matches in every particular even the preferred welding composition of the patent—except that manganese oxide has been substituted for a large proportion of the magnesium and calcium oxides; and such substitution was expressly taught by the patent as an optional composition. Such were the findings of the Trial Court, expressly affirmed by the Court of Appeals (Findings Nos. 20-4, R. 926, 927; R. 1003).

Defendants while conceding that the patent teaches the use of manganese oxide as one of the basic constituents of the flux, argue that it comprehends such use only as a minor constituent and not in major proportion. In their argument defendants choose to ignore the place in the patent where manganese is mentioned as the major constituent (p. 2, col. 1, ll. 62-5, R. 956) and mention only the place where the specification discusses the preferred composition to be compounded from the cheaper silicates.

The contention urged by defendants was rejected below by both courts. The Trial Court found:

> "24. The patent in suit teaches the substitution of manganese for other basic oxides and is not limited to the use of a moderate amount of manganese in addition to other basic oxides." (R. 927)

Again, such finding was expressly affirmed in the Court of Appeals (R. 1003).

In arriving at such finding the Trial Court was faced with the problem of ascertaining what these patent specifications, addressed as they are to persons skilled in the art, would mean to such persons. And he had to resolve that question in the face of conflicting expert testimony on the point.

Specifically, Dr. Willard testified that in his opinion manganese oxide can, under the teachings of the patent, be substituted in stoichiometric proportion as the principal constituent of the welding composition (R. 295, 316; *cf.* Finding No. 23, R. 926), that a competent chemist could readily prepare the accused Lincolnweld 660 flux by following the directions of the patent (R. 295), and that he had himself successfully synthesized such accused flux by following the directions of the patent (R. 289-290).

On the other hand, Dr. Booth was of the opinion that the patent taught him the use of manganese oxide in only moderate or minor amount rather than as a principal constituent (R. 650).

To the finding of the trier of fact, made in face of such conflicting testimony, must be given the weight normally accorded as a result of his opportunity to see and appraise the witnesses on the stand, under Rule 52(a) of the Federal Rules of Civil Procedure.

But in addition here, the Trial Court evinced his shrewdness of judgment in handling the issue. For he turned also to collateral circumstance for conclusive confirmation of his judgment. He observes (Opinion, R. 920 and *cf.* Finding 22, R. 926):

> "In this connection, the lack of any evidence of independent research or experiments by the Lincoln Electric Company in originating Lincolnweld 660 flux creates an inference that the teaching of the patent in suit was the sole origin of that composition."

There he put his finger on the sore spot—disclosed the shallowness and unreality of defendants' whole argument. How Lincoln's lawyers and experts construed the patent at the trial was in the realm of argument. But how the Lincoln Company construed the patent when they read it for manufacturing directions was an established fact.

The Lincoln Company had every reason for coming forward with evidence of independent research or any other information showing another source from which their flux might have been derived. Instead, as the Trial Court well knew, they strenuously opposed our efforts in pre-trial discovery proceedings to obtain the production of their laboratory records showing the derivation of the Lincolnweld 660 flux (see R. 20-21).

The Trial Court was also aware of their failure to question Mr. Landis, their Vice President in charge of engineering, as to the derivation of the Lincolnweld flux. The Trial Court saw Mr. Lincoln, who testified as the principal witness for defendants but offered no explanation of the origin of Lincolnweld 660 flux—not even that it was Robinoff.

Defendants also seek to give the impression that they derived their flux from the prior art and mention Miller Patent No. 1,754,566. Yet they thought so little of this

prior art patent that it was not pleaded in their answer but was included in a notice they served on the eve of the trial (R. 22).

There is no basis in the record for arguing that Lincolnweld was derived by The Lincoln Electric Company from any source other than the Jones *et al.* patent (Opinion, R. 920).

The unanimous findings below, fully supported by the record, are that the defendants' flux can be made by proceeding in exact conformity with the patent specifications—and indeed was so made.

Claims 18, 20, 22 and 23 Were Correctly Held Infringed.

Having determined that the accused Lincolnweld 660 flux could be, and was, made pursuant to the patent, the Trial Court had then to determine whether or not it infringed composition claims 18, 20, 22 and 23 (the four composition claims held valid by the Trial Court). The Trial Court held they were infringed. That judgment was affirmed by the Court of Appeals.

Both courts below held these claims were infringed in fact. The only issue they had to resolve in that connection was the effect to be given the call of each of these claims for:

> "a major proportion of alkaline earth metal silicate."

On that the Court of Appeals said (R. 1002-3):

> "The court found * * * that manganese is not an alkaline earth metal; that manganese silicate is one of the nine metallic silicates which the specification discloses that the inventors have used as principal constituents in welding compositions attaining more or less effectively the objectives of their invention; that manganese silicate when used as a principal constituent of a welding composition, prepared according to the teachings of the patent,

is a proper substitute for the silicates of the alkaline earth metals.

"The court further found that the defendants used and sold their accused composition since 1942, and are still using it, and it is substantially identical in operation and result with the ' ' the patent; and that such flux is a calcium manganese aluminum silicate, with calcium fluoride added, which in welding operation is in all respects equivalent to the compositions of the patent; that a person skilled in the art can produce the accused flux of the defendants by following the teaching of the patent in suit; that no evidence was introduced to show that the accused flux was derived from the prior art or by independent experiment, or from any source other than the teaching of the patent in suit. It was further found that in the defendants' flux the slight excess of basic oxide over stoichiometric proportions does not substantially affect its operative character and it follows the teaching of the patent; that the patent teaches the substitution of manganese for other basic oxides and is not limited to the use of a moderate amount of manganese in addition to other basic oxides.

"* * * These questions of fact are supported by substantial evidence and we may not disturb them." (R. 1002-3)

Having found that the patent fully taught the very composition which defendants use, the Courts below correctly found infringement (Findings Nos. 21, 22, R. 926; Conclusion No. 4, R. 928).

Infringement is a matter of substance, and not just of words or chemical classification. And in the present case, the uncontradicted evidence established beyond question the full identity of Lincolnweld 660 flux and Unionmelt.

It is axiomatic that it is the possibility of equating the substances for the particular purpose that counts, rather than like behavior for other purposes.

Treibacher-Chemische Werke Gesellschaft v. *Roessler & Hasslacher Chemical Co.*, 219 Fed. 210 (C. C. A. 2d 1914);

Donner v. *Sheer Pharmacal Corp.*, 64 F. 2d 217, 223 (C. C. A. 8th 1933), cert. denied, 290 U. S. 658 (1933);

Welsbach Light Co. v. *Sunlight Incandescent Gas Lamp Co.*, 87 Fed. 221, 225 (C. C. S. D. N. Y. 1898).

It is also to be observed that the teaching in the patent of the use of a major amount of manganese silicate, or in other words of the accused flux, was no accident or reflection of an untried guess. On the contrary, the inventors' notebooks (Defts' Ex. 88, off. R. 425, rep. R. 1153 *et seq.*) reveal that, having arrived at the "preferred" composition of the patent (Unionmelt 20) in test No. 422, their very next step was to make a test of the flux which is today known as Lincolnweld 660 flux (R. 43, 1162).

Many years have intervened since Jones and his two colleagues made their compounds in 1932 (R. 32). Yet these are still the ultimate in welding compositions.

That is a most extraordinary tribute to the genius of these three free-lance inventors, working entirely on their own and without the benefit of a great research laboratory or staff.

POINT IV.

Process Claims 5, 6 and 11-17 Do Not "Import" That All of the Electric Current Is Conducted by the Welding Composition in a Molten State Or That No Electric Arc Phenomenon Is Present.

Scientific Theory Is Surplusage in a Patent.

Up to this point, the Courts below were unanimous in deciding all points in favor of the plaintiff.

But here we come to a change of course on the part of the Trial Court. Having found all of the broad questions of invention and patentability and infringement so strongly in favor of the patentees, he then turned and held most of the claims invalid on what seem to be legalistic grounds.

The first group we will discuss are nine claims, Nos. 5, 6, and 11-17. These are claims covering the process or method. They were held invalid by the District Court upon a rather extraordinary ground—that they "import" an erroneous scientific theory.

The Court of Appeals reversed and upheld these nine claims and said with reference to them:

> "None of these nine claims refer in any manner to the presence or absence of an arc, either directly or by reasonable inference. The reason is that the applicants did not know, and they carefully avoided any commitment on that subject. There was no visible evidence of its presence, and for that reason it was impossible for them to determine that scientific fact, nor was it incumbent upon them to do so." (R. 1000)

Turning back to the District Court, here is what he said:

> "The import of each of these claims is that the sole conductive medium through which the electric

> current passes from the electrode to the base metal is the welding composition which is in a molten state and that the electric arc phenomenon is not present. * * *." (R. 915)

To get clearly what this "import" means, let us turn to Figure 5 inserted above, taken from Dr. Doan's chart showing the welding action in the Jones *et al.* patent, Pltf's Ex. 167, off. R. 156, rep. R. 887.

According to the District Court, the import of these nine claims is to this effect:

> that this pool underneath the granulated melt must be all liquid—that there must be no vapor core within the molten pool—and that all of the electric current must be conducted solely through the liquid or molten composition.

Now as to that holding, we say:

First — These nine process claims accurately state the scientific theory. It is plain upon the face of the patent that these claims do not have any such import.

Second—An erroneous scientific theory, even if clearly set forth, would not invalidate these claims. Scientific theory is pure surplusage in a patent, whether expressed in the specifications or in the claims.

First: These Nine Claims Accurately State the Scientific Theory.

Let us look at these claims to see if there is any import that the liquid is the sole conductor and that there is no vapor core or arc.

Claim 6 will serve as typical. It reads (p. 5, col. 1, ll. 14-30, R. 959):

"6. The process of electric welding which comprises the steps of juxtaposing a metal electrode and a conductive member on which metal is to be deposited; establishing between said member and said electrode a conductive melt comprising an alkaline earth metal silicate, alumina, and an alkaline earth metal fluoride, substantially free from substances, such as uncombined iron oxide, capable of evolving gases when fused in contact with the metal to be welded; passing through said melt an electric current of sufficient magnitude to maintain the conductivity, progressively melt the said electrode and cause the resulting molten metal to coalesce with said member; and maintaining said melt in contact with said electrode and member throughout the welding operation."

Let us repeat the portion of this claim which states the mode of electric conduction:

"* * * passing through said melt an electric current * * *."

This is unquestionably a correct statement, no matter how the words are construed. It is undenied and undeniable that an electric current passes through the melt, even if "melt" is considered to be limited to liquid material (though as we will show it properly includes vapor as well as liquid).

The liquid composition is conductive all right—as the inventors were well aware (see p. 23 above and p. 74 below).

Only by reading in the word "sole" does the Court make the statement as to electric conduction inaccurate. And the word "sole" was not present in the claim until the District Court "imported" it.

Now there is nothing anywhere in Claim 6 about "arc." The word does not appear. Claim 6 and the rest of these nine claims bear every evidence of having been drafted with scrupulous care to avoid any commitment on arc at all.

And the reason for that is made clear on the face of the patent and the file histories.

There is a sentence in the specifications of the patent which does refer to the arc. During the course of the Patent Office proceedings that sentence was amended to read:

> "Several circumstances show clearly that our process does not depend on the formation of an arc of the usual type." (p. 4, col. 1, ll. 42-44, R. 958)

In filing that amendment, the patentees stated to the Patent Office (R. 1089):

> "It is difficult, if not impossible, to define an arc precisely, and applicants have contemplated the possibility that a definition may be framed in such terms as to embrace the phenomenon which occurs in their process."

Other references to the arc occur in some of the claims—for example Claim 3, which concludes in the following way (p. 4, col. 2, ll. 51-6, R. 958):

> "• • • maintaining said material in constant contact with said electrode and work piece to avoid the formation of a substantial air-conducted electric arc between the electrode and work piece."

The Trial Court, in discussing Claim 2, which is identical with Claim 3 so far as this point is concerned, said:

> "This part of the claim implies that an arc other than a 'substantial gas-conducted' one may be the means wherein the heat or energy for the welding is generated." (R. 916)

Now compare Claim 6, which concludes in this way (p. 5, col. 1, ll. 28-30, R. 959):

> "* * * maintaining said melt in contact with said electrode and member throughout the welding operation."

The expression "to avoid the formation of a substantial air-conducted electric arc" appears in Claim 3 (p. 4, col. 2, ll. 29-39, R. 958)—but is omitted from Claim 6. Thus the Trial Court held that a claim which expressly said one specific type of arc was absent, gave no implication that other arcs were absent. Whereas, he held that a claim which avoided any expression on arcs, did give an implication that all arcs were absent.

The common-sense construction is just the opposite. Since no limitation as to an arc is expressed in Claim 6, the process covered by that claim can involve any type of arc, as long as contact is present.

Meaning of Phrase "Conductive Melt."

The Court of Appeals stated that the error of the Trial Court no doubt occurred through its interpretation of the phrase "conductive melt", coined by the inventors to identify their welding compositions (R. 1000). The Court of Appeals further said:

> "It is clear to us from its context in the patent, and the circumstances of its origin clearly indicate that the applicants intended the phrase to mean, when heated to welding temperatures, in either liquid or vaporous state." (R. 1000-1).

The patent indicates the reason for coining a new word for the new composition:

> "The conductive welding composition used in our process doubtless performs the protective functions of a flux, but it is much more than a flux." (p. 4, col. 1, lines 54-56, R. 958)

The coined word "melt" simply designates these welding compositions in whatever state.

The term "conductive" designates the melt compositions when heated to welding temperatures—in either liquid or vaporous state—so as to become conductive. The point of fusion or "melting point" is the minimum temperature at which the compositions become conductive for welding. No maximum limitation is given—nor can any be implied.

The coined phrase "conductive melt" was neither intended in the patent nor understood by those familiar with the art to be limited solely to the material in a liquid state.

The phrase "conductive melt" appears in the first description of the new process in the specifications:

> "We have discovered a novel process for electric welding wherein the necessary heat is generated by the passage of a heavy electric current between a metal electrode (usually bare) and the metal plates or similar objects to be welded, the electrode being out of mechanical contact with the objects and the current being carried across the gap between the electrode and the objects by and through a conductive melt or welding composition having appropriate electrical resistance properties." (p. 2, col. 1, ll. 20 *et seq.*, R. 956)

Later the inventors describe the manufacture of a particular sample of welding composition. After the completion of this description, they comment:

"The material was then ready for use to form the conductive melt which is the principal feature of our process." (p. 2, col. 2, ll. 59-62, R. 956)

"Melt" is used in the art to include substances not in liquid form. Examples may be found in Dr. Doan's testimony (R. 152-3, 155), and in The Welding Handbook of the American Welding Society (Pltf's Ex. 163, off. R. 356) on the illustration at page 5.

The patent expressly contemplates that a part of the melt may be in a vapor or gaseous state:

"The relatively high current densities which are preferably used superheat the molten metal and welding composition, making them highly fluid." (p. 4, col. 1, ll. 27-30, R. 958)

The expression "highly fluid" is obviously used in this sentence to connote something more than the term "molten." The word "fluid" means "liquid or gaseous." (Webster's New International Dictionary, 2d. Ed. 1940) Defendants' own expert witness, Mr. Yeomans, testified on cross examination:

"Q. And that is not a liquid; that is a gas, that you are speaking of?

"A. That is a gas.

"Q. I suppose you might call it a fluid?

"A. Technically, it is a fluid.

"Q. That is, the term 'fluid' commonly embraces both liquid and gas, does it not?

"A. Technically, it is a fluid."

Arc or No Arc.

The patent states:

"Several circumstances show clearly that our process does not depend on the formation of an arc of the usual type." (p. 4, col. 1, lines 42-44, R. 958)

This language, as the Trial Court recognized, implies the possible existence of an arc "not of the usual type," *i.e.* not an open arc (Opinion, R. 916).

An amendment was filed by the applicants for the purpose of expressing uncertainty as to the presence of an arc and conceding the possible presence of a new kind of arc—an arc not "of the usual type"—an arc which was radically different from the "intense dazzling arc" of all prior art welding. We quote this amendment below at page 74 *et seq.*

The District Court itself, after a most careful study, concluded: "* * * it is impossible to say with complete certainty that there is not an arc." (Opinion, R. 909)

Because of this uncertainty, these claims were carefully drawn to avoid commitment on the question of the arc. Instead, these nine process claims were drawn to define the plain observable facts of the process. The one thing they all emphasize is "contact between electrode and melt." That was new. No prior process had it.

As the District Court put it (R. 911):

> "* * * the welding rod somewhere above its very end is in contact with, or rather is surrounded by, the pool of fused flux * * *."

Thus, the complete accuracy of these claims in speaking of "contact" between the rod and the molten pool is manifest on the face of the Court's opinion.

Of what conceivable use, in any case, would have been a statement as to whether or not there was an arc under the molten pool? It would not help the public in determining the boundaries of the invention, or in distinguishing it from the prior art, since even extensive and elaborate experimentation has not established with certainty whether or not an arc is present (Opinion, R. 909).

Contact, on the other hand, is an effective means for distinguishing the invention. It is observable, and is itself the key both to the difference in outward appearance and to the difference in results between this process and all the prior art (see pp. 34-38 above).

"Shift of Scientific Theory" During Patent Office Proceedings.

Goodly portions of Petitioners' Brief are devoted to arguments asserting that there was a shift of scientific theory during the Patent Office proceedings after the first application. The reason why defendants talk so much about this is evident—they have nothing else to talk about.

The Trial Court stated that some shift of theory was evident but that the new theory advanced in the second and third applications was "never unequivocally espoused." (R. 913-4)

The District Court suggested in its Opinion that a new theory of conductivity originated with the patent solicitors of the Linde Company and not with the inventors (R. 913-4). Nothing turns on whether there was any shift of theory, or, if there was, whether the solicitors or the inventors were responsible, although the District Court was in error on both scores.

Of course the second and third applications differed from the first. That is why they were filed. Kennedy testified with respect to the second and third applications that the inventors agreed with their contents and, in fact, did the necessary work to derive their contents and that they were trying to give the examiner the latest and best information they had on the subject (R. 84, 90).

The theory expressed in the three applications varied in emphasis but was consistent from beginning to end. The

first application was written by Kennedy and filed by the inventors before they first became acquainted with the Linde Company or its patent solicitors (R. 71); and in that application they referred to their process as "a new method designated as submerged-arc electric welding" and also referred to materials which "become increasingly conductive as the temperature rises." (Pltf's Ex. 125, off. R. 26, rep. R. 1046, 1054) In fact, claim 19 of that first application speaks of the "electric current passing substantially wholly through" the flux (R. 1054).

In the first application the process is referred to as an arc welding process. Kennedy on his cross-examination said:

> "The word 'arc' to us did not necessarily imply how our process works, any more than to say that an electric lamp burns implies there is combustion in the filament." (R. 65)

Mr. Kennedy also testified that the inventors were in doubt from the beginning as to whether the process involved an arc, and his testimony is confirmed by many entries in the inventors' notes (Defts' Ex. 88, off. R. 425, rep. R. 1153-1264). The first suggestions emphasizing conductivity of the melt originated with the inventors (R. 63, Pltf's Ex. 158, off. R. 133, rep. R. 884, 885).

In this connection, we wish again to call attention to the following statement made by the inventors in the amendment, which added, after the statement "our process does not depend on the formation of an arc", the words, "of the usual type":

> "It is difficult, if not impossible, to define an arc precisely, and applicants have contemplated the possibility that a definition may be framed in such terms as to embrace the phenomenon which occurs in their process.

> "There can be no question, however, that there is no such arc involved in their process as occurs in every prior arc process including that of Robinoff *et al.* Anyone, if he bears in mind the intense dazzling arc which less than fifty amperes will evoke and stands by one of applicants' machines and sees a weld made with two thousand amperes but with little or no visible evidence that a heating operation is being carried on, will quickly be convinced that here is something quite different from any arc welding process known to the art." (Pltf's Ex. 126, off. R. 26, rep. R. 1089, read into record at R. 130)

By that statement the inventors frankly told the Patent Office that an arc may be defined so as to encompass their new welding. Only after that frank statement were the process claims allowed by the Patent Office. That statement still stands today and correctly embodies the plaintiff's position in supporting the patent.

Thus it is clear that the denial of any type of arc was "imported" into these claims by the District Court. Such a "construction" of the claim, for the purpose of destroying it, violates a sound principle of law, even if there were some basis for such "import."

Mr. Justice Stone, speaking for this Court, said:

> "* * * if the claim were fairly susceptible of two constructions, that should be adopted which will secure to the patentee his actual invention, rather than to adopt a construction fatal to the grant [citing cases)." (*Smith* v. *Snow*, 294 U. S. 1, 14 (1935))

In *Apex Electrical Mfg. Co.* v. *Maytag Co.*, 125 F. 2d 182, 187 (C. C. A. 7th 1941), *cert. denied*, 314 U. S. 687 (1941), the Court said:

> "The most that can be said is that the language of the claim creates an ambiguity with respect to this

> contention. * * * However, if they were evenly balanced, and we can not concede more, it would be our duty to construe the language in such manner as to preserve the patent and not destroy it. * * * "

In *Strong-Scott Mfg. Co.* v. *Weller*, 112 F. 2d 389, 394 (C. C. A. 8th 1940), the Court said:

> "* * * if an ambiguity was created because of differences between the specification and claims and the drawings, it was the duty of the court below to resolve the ambiguity in favor of the pat ntees, since it is the policy of the law to preserve the substance of the patent if that is reasonably possible."

Second: An Erroneous Scientific Theory, Even if Expressly Stated, Would Not Invalidate These Claims.

American industry over a long period of years has practiced the Jones *et al.* invention (R. 395-8). And the benefits obtained have not been one iota the less because the experts are uncertain as to the scientific theory—or as to the correct interpretation of the patent on the matter of scientific theory. Knowledge of the presence or absence of an arc phenomenon hidden away within the mantle of molten composition, is utterly immaterial to persons desiring to accomplish the objectives of the invention.

Scientific theory is surplusage in a patent. If correct, it does not help the patent. If erroneous, it does not harm it. The art almost invariably precedes the science. Lots of people used fire before anyone understood the chemical phenomenon.

To determine whether something is to be regarded as "scientific theory" or as an essential element of the invention, the ultimate test is whether it affects the ability of those skilled in the art to practice the invention.

The Trial Court, in dealing with the specifications, recognized this principle. The Trial Court decided in favor of the patentees the all-important question of whether a patentable process was disclosed in the specifications, and in that decision the District Court correctly regarded the possible existence, or non-existence, of an arc as a question of scientific theory and surplusage. Indeed, the Court reached this conclusion:

> "The patent's specification contains a sufficient disclosure of the method of welding invented to enable persons 'skilled in the art' to accomplish the objective by following the teachings outlined in it. This, in my opinion, is the test of this point of validity regardless of whether an erroneous theory of operation is advanced." (Opinion, R. 914)

This conclusion was supported by a quotation from *Westinghouse Electric Mfg. Co.* v. *Montgomery E. L. & P. Co.*, 153 Fed. 890, 901 (C. C. A. 2d 1907), to the effect that an inventor:

> "* * * is not to be deprived of the benefit of his invention because he may have been mistaken in his statement of the reasons why the result was secured, or may have failed to correctly state the theory of their operation."

The Trial Court failed, however, to apply this same principle to the claims.

Yet, as stated in 2 Walker on Patents (Deller's Ed. 1937), page 1231:

> "A claim covers and secures a process [*Smith v. Snow*, 294 U. S. 1, 22, 79 L. Ed. 721 (1935)], a machine, a manufacture, a composition of matter, or a design, but never the function or result of either, nor the scientific explanation of their operation."

To the same effect is the statement of Mr. Justice Stone in *DeForest Radio Co.* v. *General Electric Co.*, 283 U. S. 664, 684-685 (1931):

> "It is method and device which may be patented and not the scientific explanation of their operation."

The statutory requirements for a patent claim (35 U. S. C. §33 (1940)) are simply that the inventor:

> "• • • shall particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery."

These nine process claims, Nos. 5 6 and 11-17 "particularly point out and distinctly claim" that the welding zone is sealed by stating expressly that contact is maintained throughout the welding operation. Also, they adequately define the inventors' new welding compositions in substantially the same language as used in claims 18, 20, 22 and 23, which were upheld by the District Court as valid composition claims.

An analogy to the present case may be found in *Petroleum Rectifying Co.* v. *Reward Oil Co.*, 260 Fed. 177 (C. C. A. 9th 1919), *cert. denied*, 251 U. S. 554 (1919). The patent was for a process of removing suspended water globules from oil by passing the emulsion between two electrodes between which a high electric potential was maintained. Claim 1, which was typical, described the voltage required as—

> "'• • • sufficient voltage to produce coalescence of the suspended particles in such wise as to cause the rapid separation of the two liquids throughout the body of the mixture, and at the same time prevent the coalescing globules from forming complete chains, short-circuiting the electrodes.'" (260 Fed. at p. 178)

The defendant argued that the language in the foregoing quotation described a method which excluded the possibility of short-circuits. In both the patentees' process and the defendants' process momentary water chains were formed causing momentary short-circuits which were immediately disrupted by the current, and the defendant argued that the patent was either invalid or not infringed.

This argument was unanimously rejected by the Court of Appeals. The Court felt, first, that it was clear from the patent that the language quoted above was intended to mean complete and permanent short-circuits, when read in the light of the specifications.

But even if the inventors' understanding or description of this scientific principle of operations in the claim was incorrect, the Court pointed out that it was immaterial. The lower court had held the patent not infringed. The Court of Appeals, reversing the lower court, held the patent infringed, and said:

> "They [the patentees] realized that the momentary passage of short currents between the electrodes would not 'short-circuit' their current in the sense in which they used that term in their claims.
>
> "But it was not essential that they should either understand or set forth the principle on which their process operated * * *." (260 Fed. at p. 181)

The Court of Appeals for the Second Circuit has given the same answer to the same argument, in an opinion given by Judge Frank speaking for a unanimous court, in *Katz v. Horni Signal Mfg. Corp.*, 145 F. 2d 961, 963 (C. C. A. 2d 1944), *cert. denied*, 324 U. S. 882 (1945):

> "Defendant argues that the statement in the claim that the induction results from 'the disturbance of the earth's magnetic field normally attending the passage of an automobile' is not correct; that what

actuates the coil is the 'residual magnetism' in the automobile. But it is immaterial whether patentee correctly understands how his device operates. *Diamond Rubber Co.* v. *Consolidated Rubber Tire Co.*, 220 U. S. 428, 435-436, 31 S. Ct. 444, 55 L. Ed. 527; *Procter & Gamble Co.* v. *Berlin Mills Co.*, 2 Cir., 256 F. 23, 28, reversed on other grounds in 254 U. S. 156, 41 S. Ct. 75, 65 L. Ed. 196."

See also,

Malignani v. *Jasper Marsh Consol. Electric Lamp Co.*, 180 Fed. 442, 446-8 (C. C. D. Mass. 1910).

POINT V.

Claim 27 is a Valid Composition Claim. It Does Not "Import" Anything as to the Electric Arc Phenomenon.

The District Court held composition claim 27 invalid because it contained the words "a prefused electric welding composition which is conductive when molten * * *." The Court felt that these words gave the "inevitable impression * * * that the electric current passes solely through the composition while it is in a molten state." (Opinion, R. 917-8)

The Court of Appeals held that this was error and reversed (R. 1002).

The argument advanced in the preceding Point IV of this brief to sustain the validity of the group of nine process claims (5, 6, and 11-17) applies with full force to composition claim 27, but that claim deserves special consideration. Surely, theory as to a process should have no bearing on the validity of a composition claim.

Moreover, the Trial Court's theory as to how a process should be described has no bearing upon the composition covered by claim 27. This is a composition claim, and "designates alkaline earth metal silicates as the principal constituents of the composition," and comes squarely within the Trial Court's ruling which upheld claims 18, 20, 22 and 23.

In any case, the construction put by the Trial Court on claim 27 was erroneous. To state that a material is conductive when molten, is not to state that the material is always in a molten state, or that it is not conductive when superheated to a vaporous state.

POINT VI.

Claims 1, 3, 4, 7, 8 and 9 are Valid Process Claims.

To "Particularly Point Out and Distinctly Claim" the New Process of Welding, It Was Not Necessary That These Claims Specify the Chemical Composition of Material Used.

The Court May Look to the Specifications for a Description of the Elements Mentioned in the Claims.

Here we come to the second group of process claims invalidated by the District Court—Claims Nos. 1, 3, 4, 7, 8 and 9.

Here the Trial Judge had no difficulty with imported theory. The ground of decision was different.

These six claims were held invalid on the ground that they failed to display that particularity and distinctness required by the statute.

Petitioners' Brief covers this at pages 46-50 and gives the impression that the contention would apply to all of the process claims. That is not true. Other process claims

give just as specific detail about the composition as the four composition claims the Trial Court held valid.

With respect to the group of six process claims, the Court of Appeals reversed and said:

> "We think it was unnecessary in a process claim to refer in any way to the chemical constituents of the composition where, as here, they are fully set forth in the specification. We think this view is fully supported in principle by the Telephone Cases, 126 U. S. 1; Union Oil Co. of California *v.* American Bitumuls Co., 109 F. 2d 140; Van der Grinten *v.* Dietrich-Post Co., 85 F. 2d 637; and Glade *v.* Walgreen Co., 122 F. 2d 306.
>
> Furthermore, these claims now under consideration seem to be sufficiently definite when construed in the light of the specification." (R. 999)

The requirement of the statute is simply that the inventor:

> * * * * shall particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery." (U. S. C. A. Title 35, Sec. 33)

As stated in *Petersen* v. *Coast Cigarette Vendors, Inc.*, 131 F. 2d 389, 391 (C. C. A. 9th 1942):

> "This only requires that the claims point out the invention, not that they redescribe it."

No witness offered one word of testimony impugning the particularity or distinctness of these six process claims. Nor did any witness express any inability to determine that the accused Lincolnweld process and composition came squarely within these claims.

On the contrary, Mr. Fishleigh, the patent expert called by plaintiff, testified as to his study of the patent in suit,

(R. 343-6). His charts are in evidence, Plf's Ex. 204 (off. R. 372), and point out specifically wherein each element of each claim finds support in the specifications. Defendants did not cross-examine Mr. Fishleigh on this part of plaintiff's case (R. 372, 377).

The Trial Court held that these six process claims were "too broad and indefinite" because they "make no reference to the chemical constituents of the welding composition to be used in the novel process discovered by the patentees." (R. 915).

The District Court in effect advanced the proposition that there is no way of describing the process except in terms of the chemistry of the composition.

Yet, as the Court of Appeals noted, the Trial Court itself explicitly defined the novel process without adverting in any way to chemical composition. Thus, Finding No. 7 framed by the Trial Court said:

> "Their invention also included a novel welding process in the sense that the electric arc present between the electrode and base metal is sheathed by a mantle of molten welding composition and in that the conductive arc area is composed predominately of vaporous welding composition." (R. 924)

There we have the Trial Court's own description of the process. No doubt the Trial Judge, in drafting his findings, was seeking to be just as definite and particular as any patentee in drafting his claims.

The executives and counsel for the 740 companies who took Unionmelt licenses satisfied themselves as to the scope of the patent claims and paid $6,000,000 of royalties on that basis.

The Lincoln Company evidenced complete ability to ascertain that their Lincolnweld process was an infringe-

ment. Not one of the Lincoln witnesses came forward to swear to any other source for Lincolnweld. Since they were accused, their failure on the stand to offer a factual explanation as to the creation of Lincolnweld was an admission that they were not able to do so. The District Court found that the defendants had no difficulty in understanding or following the teachings of the patent in suit (Finding No. 22, R. 926).

As was aptly stated in *Colgate-Palmolive-Peet Co.* v. *Lever Bros. Co.*, 90 F. 2d 178, 191 (C. C. A. 7th 1937), *cert. denied*, 302 U. S. 729 (1937):

> "Appellee attacks the validity of the patent because indefinite. It is particularly urged that the process claims are lacking in specificity. In answer thereto it may be said that appellee had no difficulty in understanding or following the teachings of Lamont."

Claims Are to be Construed in the Light of the Specifications.

A patent would be a voluminous document, indeed, if each claim had to repeat the entire description of the invention.

Instead, the courts have long followed the principle that the claims are to be read in the light of the specifications. A patent, like other documents, is to be read as a whole, and one part may throw light on another part.

This principle was stated by this Court as early as 1850 in *Hogg* v. *Emerson*, 11 How. 587, 606 (U. S. 1850):

> "The court did right, too, in holding to the propriety of looking to the whole specification, and also to the drawings, for explanation of any thing obscure."

The principle has been repeatedly affirmed by this Court (see *e. g., Temco Electric Motor Co.* v. *Apco Mfg. Co.*, 275 U. S. 319 (1928); *Schriber-Schroth Co.* v. *Cleveland Trust Co.*, 311 U. S. 211, 217 (1940)).

In *Glade* v. *Walgreen Co.*, 122 F. 2d 306, 311 (C. C. A. 7th 1941), *cert. denied*, 314 U. S. 692 (1941) it was stated:

> "• • • but we do not understand that each claim must describe every feature set forth in the other claims and in the specification, and in construing any claim it is to be done in view of the device of the character described in the specification."

Even more succinct is the statement of Judge Learned Hand in *Western States Mach. Co.* v. *S. S. Hepworth Co.*, 147 F. 2d 345, 349 (C. C. A. 2d 1945, *cert. denied*, 325 U. S. 873 (1945):

> "All claims are to some extent more general than the specifications, and all must be read upon them."

This rule is embedded in the patent law to such an extent that the most commonly used treatise advises a draftsman not to include in the claims any phrases referring to more detailed descriptions in the specifications, since such a reference is automatically implied. See 2 Walker on Patents pages 1264-1266 (Deller's ed. 1937).

An entire generation of patents has been drawn and issued in reliance upon this principle or rule of claim construction.

These Process Claims Specify the "Properties" the Welding Composition Must Have.

The Trial Court, as well as the Court of Appeals, found that the specifications contained a sufficient disclosure for practice of the invention (R. 914, 1002).

The Trial Judge, speaking of the patented process, said:

> "The distinctive characteristics of this arc zone, viz.: the dominant element making up the vaporous ionized area and the protective surrounding sheath of molten substance, can be attributed only to the peculiar properties of the welding composition which is employed." (Opinion, R. 911-912)

It is those "peculiar properties" which are used in the process claims to characterize the composition, rather than simply cataloging a series of compounds which exhibit those properties.

Of great importance is this categorical statement in the specifications:

> "* * * the properties of a successful welding composition for this method of welding are these"

Then follow the five "musts" which we have quoted above, page 39.

These five "musts" constitute an integral part of each claim. They serve to "particularly point out and distinctly claim" the new process as if they were physically repeated in each claim—that is their obvious purpose. It is not possible for anyone to read this patent without realizing that the composition mentioned in the process claims is one and the same as the "successful welding composition" which is described in the specifications.

Characterization by its "properties" of a material used in a process has been accepted in many instances. For example, in *Union Oil Co. of California* v. *American Bitumuls Co.*, 109 F. 2d 140 (C. C. A. 9th 1940), the court had before it a patent covering a process for manufacturing a stable emulsion of asphalt. The claim in suit characterized the asphalt used in the process as "asphalt containing

in its natural state a saponifiable material solid at normal temperature." The material in the asphalt, so characterized, was found in certain natural asphalts and had not even been chemically identified by the patentee. This characterization of the properties of the material simply in terms of its capacity for saponification and solidity at normal temperature, was attacked as an insufficient designation of the material; but the court rejected such contention and said:

> "The fact that there may be, and indeed are, asphalts which cannot be emulsified by this process [because they did not contain the material noted above], does not render the patent indefinite or uncertain. The patent does not attempt to cover any process for emulsifying an asphalt which was incapable of emulsification by the use of alkali alone. We conclude that the patent is not uncertain in this respect." (109 F. 2d at pp. 143-4)

To the same effect is the decision in *Van der Grinten* v. *Dieterich-Post Co.*, 85 F. 2d 637 (C. C. A. 9th 1936). There a claim was held valid and infringed which covered a process of making photographic reproductions of drawings. The claim characterized the most important of the agents used in the process simply as "a reducing agent capable of arresting under normal conditions the discoloration of the components forming the background of said prints."

These cases show that when a description of a substance by its properties will enable one skilled in the art to find or make such a substance, the description is of course adequate. When it is the properties of the substance that are important, those are indeed the best characteristics to select in describing it.

In our present case, the source of the Trial Court's error in reasoning was, we believe, this unusual circumstance: In

order to invent the process the inventors had perforce first to invent a chemical composition that could be used to carry it out.

But having discovered one, having in fact compounded several of such compositions, they were not foreclosed by reason or authority from claiming broadly the process.

To few men is given the perception for such a leap forward. Such men should not be penalized by robbing them of the privileges of definition open to an inventor of a process employing old agencies or materials.

To find analogies to the double stride made by the inventors here is difficult. A precedent is found, however, in the *Telephone Cases,* 126 U. S. 1 (1888). There, Bell's fifth claim quoted at the opening of the Chief Justice's opinion, (p. 531) covered a process. It read:

> "The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

The Court held this claim to the method, as well as claims to the specific instrument employed, valid and infringed. The Court said:

> "Bell discovered that it [transmission of speech] could be done by gradually changing the intensity of a continuous electric current, so as to make it correspond exactly to the changes in the density of the air caused by the sound of the voice. This was his art. He then devised a way in which these changes of intensity could be made and speech actually transmitted. Thus his art was put in a condition for practical use.
>
> "In doing this, both discovery and invention, in the popular sense of those terms, were involved; dis-

covery in finding the art, and invention in devising the means of making it useful. For such discoveries and such inventions the law has given the discoverer and inventor the right to a patent—as discoverer, for the useful art, process, method of doing a thing he has found; and as inventor, for the means he has devised to make his discovery one of actual value. Other inventors may compete with him for the ways of giving effect to the discovery, but the new art he has found will belong to him and those claiming under him during the life of his patent." (126 U. S. at pp. 532-3)

Claim 1 Uses the Coined Word "Melt" Which is Fully Defined and Explained in the Patent.

Everything said above under this Point applies to Claim 1 as well as the other claims in this group.

But Claim 1 should have additional attention. It expressly refers to the composition as the "melt." This word was adopted in the patent for the specific purpose of identifying the new welding composition.

The Trial Court failed to note that fact and treated this claim along with the other five.

Claim 1 reads as follows:

"The process of electric welding which comprises the steps of juxtaposing an electrode and a conductive member on which metal is to be deposited; establishing between said member and said electrode a conductive path of a high-resistance melt of chemically stable fusible material having at welding temperatures substantially the fluidity and electrical conductivity of a fusible silicate, and substantially free from substances capable of evolving large amounts of gases during welding; passing through said melt an electric current of sufficient strength

> to maintain its conductivity, progressively melt the required amount of metal, and cause the resulting molten metal to coalesce with said member; and maintaining said melt in contact with said electrode throughout the welding operation to avoid the formation of a substantial air-conducted electric arc between the electrode and the said conductive member." (p. 4, col. 2, ll. 9 *et seq.*, R. 958)

The use of the coined word "melt" in Claim 1 eliminated any question of construction. In *Rajah Auto Supply Co.* v. *Belvidere Screw & Machine Co.*, 275 Fed. 761, 763 (C. C. A. 7th 1921), the Court said:

> "We have so frequently said that each patentee may define his own terms, regardless of common or technical meaning, that it is unnecessary to refer to these decisions. Fairness to any patentee requires the court to accept his definition of words, phrases, and terms."

This rule has been given frequent and emphatic application.

Cincinnati Rubber Mfg. Co. v. *Stowe-Woodward, Inc.*, 111 F. 2d 239, 241-2 (C. C. A. 6th 1940);
International Cork Co. v. *New Process Cork Co.*, 6 F. 2d 420, 422 (C. C. A. 2nd 1925);
Lincoln Stores Inc. v. *Nashua Mfg. Co.*, 157 F. 2d 154, 158 (C. C. A. 1st 1946), *cert. denied*, 329 U. S. 811 (1947).

POINT VII.

Process Claim 2 and Composition Claims 24 and 26, Which Use the Generic Terms "Silicate" and "Metallic Silicate" Are Likewise Valid When Read in the Light of the Specifications.

The new welding composition is described as a "silicate" in process claim 2, as "metallic silicate and calcium fluoride" in composition claim 24, and as consisting chiefly of "silicates" in composition claim 26 (R. 958, 960).

We contended that "silicates" and "metallic silicates," when read in the light of the specifications, meant the nine metallic silicates which had been proved operative.

The District Court rejected our contention and held these claims invalid (R. 918-9).

The Court of Appeals upheld our contention and reversed the District Court (R. 1001-2).

The District Court based its decision upon the authority of *Aluminum Co. of America* v. *Thompson Products, Inc.*, 122 F. 2d 796, 798 (C. C. A. 6th 1941). In that case the Court of Appeals stated the following general principle and its exception:

> "• • • a claim which is capable both of broad and narrow construction in the light of the specification will be given that construction which sustains the patent, but • • • where, from the specification or the history of the application or the language of the claim it is clear that the patentee intended to claim and the Patent Office intended to grant the broader monopoly which turns out to be invalid, the courts will not, for the arbitrary purpose of saving the claim, read into it a limitation which it does not have."

The *Aluminum Co.* case involved the following facts: The patent in suit related to an alloy for use in aluminum pistons. The invention consisted of adding to pure aluminum between 3 and 15 per cent. silicon, and more or less would be inoperative. Claim No. 7, not involved in the suit, was a narrow claim with the specific percentages for the silicon. The claims in suit were broad and did not specify any percentage of silicon. The patentee argued that the broad claims could be given the narrower meaning by construing them in the light of the specifications.

However, the court held in the *Aluminum Co.* case that the patentee necessarily intended a broader monopoly in the claims in suit, since Claim No. 7 had specifically claimed the narrower monopoly.

In our present case the record is bare of any indication that the patentees intended to claim, or the Patent Office to grant, a "broader monopoly." Our facts call for the application of the general rule of construction and not the limited exception.

Here are our facts: Nine silicates coming within the invention in suit are listed in the specifications (p. 2, col. 1, ll. 55-68, R. 956). In none of the other claims of the patent in suit may be found either a specific listing of all of the nine silicates or any general term covering all nine. (Some claims use the term "alkaline earth metal silicates," but only three of the nine silicates are alkaline earth metal silicates.) Only in the group we are now discussing, claims 2, 24, and 26, is there any general term covering all nine silicates.

The only common characteristics possessed by the alkaline earth metal silicates and their stated equivalents is the fact that all are "silicates" or "metallic silicates." There is no other term which could have been used to include all nine in a claim—short of listing all nine of them by name in

the claims, a practice strongly frowned upon by the Patent Office (*Cf. In re Thompson*, 154 F. 2d 189 (C. C.P. A. 1946)).

When the patent is read as a whole, it is plain that the terms "silicates" and "metallic silicates" refer to the nine listed in the specifications. Each had been proved to operate successfully in the patent in suit (Opinion, R. 917; Finding No. 10, R. 925).

In the analogous case of *Smith, Kline & French Laboratories* v. *Clark & Clark*, 157 F. 2d 725 (C. C. A. 3d 1946), *cert. denied*, 329 U. S. 796 (1946), the specifications disclosed two salts of the substance 1-phenyl-2-aminopropane, one salt to be obtained by reaction with hydrochloric acid, and the other salt to be obtained by reaction with sulphuric acid. The patent had only two claims:

> (1) "As a new composition of matter, a salt of 1-phenyl-2-aminopropane,"
>
> (2) "As a new composition of matter, the hydrochloride of 1-phenyl-2-aminopropane." (viz., the salt obtained by reaction with hydrochloric acid)

Claim 1, when read alone, had no limitation that the salt be that obtained by reaction with sulphuric acid (known as amphetamine sulphate), but the Court read the entire patent and concluded, at page 728:

> "Construing claim 1 in the light of the specification may we read the second of the two salts named in Alles' specification, viz., the sulphate (the hydrochloric being already preempted by claim 2) into claim 1? In other words, may we treat amphetamine sulphate as a salt claimed in claim 1? We conclude that we may and should do so."

Under the foregoing case, under *Smith* v. *Snow*, 294 U. S. 1, 14 (1935), and under the general rule stated in the *Aluminum Co.* case itself (122 F. 2d, at p. 798), claims 2, 24 and 26 are valid.

POINT VIII.

The Manufacturing Companies Licensed to Use the Patented Process Were Perfectly Free to Buy Any Materials or Equipment from the Linde Company or Any Other Source.

No Evidence Whatsoever Was Offered to Show any "Tying Agreements" or Other Misuse of the Patent.

Now we come to a point which affords a ready gauge of the weakness of Petitioners' Brief.

Here the facts are non-technical and easily understood.

Petitioners' Brief, at page 67, has this impressive point heading:

> "The Whole has been Implemented by Unlawful Tying Agreements."

Lincoln offered no witnesses on this point. With the hundreds of licensees available, it is fair to assume that, had Linde forced or "tied" the sale of equipment or rod, Lincoln would have produced such evidence.

The Linde Company has adopted and followed a truly enlightened policy in making this invention available to American industry, just as it has followed an enlightened policy in sharing the royalties so liberally with the three inventors.

The Linde Company registered the Jones *et al.* patent with the Patent Office and thus made it available generally to the public for licensing on standard terms. (R. 399, Plf's Ex. 214).

The Linde Company, as well as other companies, sold welding heads and rod suitable for use in Unionmelt welding. The companies who purchased rod from the Linde

Company had the option of buying on open order, or under a form of contract. The rod contract was entirely separate from the license agreement. The rod contract ran for a term of one year and covered the buyer's entire requirements for rod for use in this submerged melt welding process.

The single fact which Petitioners' Brief relies on to support the charge of "unlawful tying agreements" is this: That as to one-tenth of the contract customers for rod, the rod contract bore the same date as the license agreement. The record shows affirmatively that this was no indication that the two separate instruments were executed simultaneously or by the same individuals (R. 406).

At the trial Mr. Cornwell, Vice President of Linde, testified for plaintiff with respect to the licenses under this patent (R. 400-8). Defendants had full opportunity to cross-examine. Defendants also had full opportunity through discovery proceedings to explore the files and records of the Linde Company and its licensees. Not a scintilla of evidence was elicited to show any misuse of the patent.

Finding No. 28 made by the Trial Court was as follows:

> "Plaintiff does not impose as a condition of a license under the patent in suit, nor does plaintiff otherwise impose on its licensees, any requirement, condition, agreement or understanding as to the purchase or use of any goods, wares, merchandise, machinery, supplies or other commodities; and the licensees are free to buy and use any materials and equipment from any source." (R. 927).

The Court of Appeals affirmed.

The following is a brief statement of the evidence presented by us and accepted by the Trial Court as the basis for its Finding No. 28, quoted above.

Mr. Cornwell wrote Mr. Lincoln on September 10, 1943, two years prior to the beginning of the present action, saying:

> "We have repeatedly told our licensees that they are perfectly free to buy any materials or equipment they desire from you or any other manufacturer, and as far as that goes we have gone even further than that and recommended that they buy such equipment and materials, if they felt they were superior to what we are offering for sale." (Pltf's Ex. 217, off. R. 404, rep. R. 1143)

There was no requirement with respect to purchase or use of the Linde Company's welding material or rod or any other material or equipment (R. 403). Nor was there any condition imposed by the Linde Company that, in order to buy rod, the customer must enter into a rod contract. Many purchasers did not execute a rod contract. The rod contract ran for a term of only one year—whereas the license agreement (Pltf's Ex. 216-S, off. R. 401, rep. R. 1137) runs until the patent expires in 1953.

The rod contract forms were introduced in evidence (Pltf's Exs. 218, 218 A-G, off. R. 404; Ex. 218-G, rep. R. 1145). Plaintiff's Exhibit 218-G was the form in use at the time the present suit began and at the time of trial. It covered the purchase of

> "* * * the Buyer's entire requirements of bare rod electrodes for use in a process of electric welding known as the Unionmelt Welding Process (but sometimes designated by other names being the process described in Chapter 7 of the 1942 edition of the American Welding Society's 'Welding Handbook') for the period of one (1) year * * *."

The reference to the buyer's "entire requirements" for use in the Unionmelt welding process served only as a measure of the amount of rod covered by the contract.

There was nothing to support defendants' statement that there were "tying agreements"—nor was there anything to support the statement on page 29 and again on page 67 of their brief that somehow the rod contracts and the licenses were "coupled."

The series of plaintiff's sales letters comprising defendants' exhibits 98 A-Y were put in evidence (off. R. 425, rep. R. 1265-1322). They, too, rebut any suspicion that any illegal condition was imposed. Plaintiff distributed to its sales offices form letters to be used in the negotiation of licenses (Defts' Ex. 98-L, R. 1288). Each of the forms contained a paragraph expressly negativing any express or implied condition. For example in one attached form letter, the following paragraph appeared (R. 1296):

> "You will note from this form, as was also emphasized during our conversation, that the license which we offer is for the use of our patented process, and that the agreement in no way restricts the licensee to the use of any special equipment or materials. However, our licensees generally prefer our equipment and supplies because of highly satisfactory performance and economy." (emphasis in original)

Moreover, in plaintiff's general instructions to plaintiff's sales offices (Defts' Ex. 98-C) respecting license agreement negotiations and rod purchase contract negotiations, the following appeared:

> "The rod purchase contract should not be presented or seriously discussed until after the license agreement forms have been presented to the prospective licensee, and when possible, the negotiation completed. * * * but regardless of who signs the

contract, it should always be remembered that the source of rod is optional with the licensee and that the two agreements, though both related to the same finished weld are entirely independent.

"Since the rod purchase contract is only incidentally related to the license agreement, and since rod will not be used until after the installation is completed, the date in paragraph numbered 1 of the rod contract should preferably be later than the beginning date of the license period, and could most reasonably be approximately the date of the first rod shipment."

When questioned about the second paragraph quoted above, during his cross-examination, Mr. Cornwell very properly stated that it was written

> "Just so that no one could gain an inference that there was any connection between the two." (R. 421)

In dismissing Lincoln's claim that the Linde Company had misused this patent, the Trial Court said:

> "* * * it is hard to conceive what more plaintiff could have done to safeguard itself from charges of having unduly broadened its patent monopoly." (R. 922)

Conclusion.

These free-lance inventors solved fundamental problems which had plagued the welding art for half a century. No other invention has contributed so much to the advancement of the art of joining metal. The revolutionary performance capabilities of this invention have led to its wide adoption by industry. Its merits have been amply demonstrated.

The defendants have deliberately copied their Lincoln-weld process and flux from the patent in suit.

All this is undisputed or has been found by the District Court on the overwhelming weight of the evidence.

The Court of Appeals has reviewed the evidence, and has affirmed the District Court on the merits of the invention and on its patentability and infringement.

The constitutional policy embodied in the patent laws "to promote the progress of science and the useful arts" will best be served by construing this patent—the contract which the Government made with these inventors—so as to protect their just rights in their invention for the limited statutory period.

The judgment should be affirmed.

Respectfully submitted,

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December 24, 1948.

APPENDIX A.

CORRECTION OF ERRATA IN PETITIONERS' BRIEF.

Many statements are made in Lincoln's brief which find no support in the record and which are not in accordance with the facts. This Appendix will be devoted to singling out an illustrative sampling of such instances.

"Unreversed Findings and Erroneous Conclusions".

Although this is an important point in the Lincoln brief (p. 69), there is absolutely no citation to the record contained in it. We take that failure as a demonstration of Lincoln's inability to find support for this accusation.

We have already covered this portion of petitioners' brief under Point I above, page 44 *et seq.*

"Abandonment".

Petitioners' Brief, page 16, states that the Court of Appeals restored "the abandoned and disclaimed arc to the patent." This statement is repeated, and even put in a caption "Court has Restored to Patent Abandoned Sheathed-Arc Claim." (Petitioners' Brief, p. 32)

Nowhere do they cite or quote the instrument of abandonment.

A glance at this instrument destroys their argument. It is printed at R. 1071; and, referring to the first application which the inventors filed on February 21, 1933, it says:

> "The above-identified application, but not the invention disclosed therein, is hereby formally abandoned in favor of application Serial No. 44,142 filed October 9, 1935 by Lloyd T. Jones, Harry E. Kennedy and Maynard A. Rotermund. The latter

> application contains claims directed to the invention claimed in the formal [*sic*, former] application."

As this instrument expressly states, there was no abandonment of the invention nor change in subject matter of the claim. All that happened was that the claims were redrafted in the normal and routine progress of prosecution of the application in an effort to state the invention with maximum clarity.

This instrument was dated May 12, 1936. By that time the inventor's third application, filed October 9, 1935, had been examined and passed for issue, and a notice to that effect had been sent to the patentees. This is shown by the first page of the file wrapper for this third application, reproduced at R. 1104 A. That page bears these notations:

> "Examined and passed for issue May 8, 1936"

and

> "Notice of Allowance May 8, 1936."

Presumably, the administrative procedure of the Patent Office called for some sort of paper to close out the file on the first application.

Whether Robinoff had a "Submerged Arc" Process.

Petitioners' Brief, page 11, says:

> "Over 1,000 miles of welded pipe had been produced by the Robinoff submerged arc process in the National Tube Company's Christy Park mill prior to the advent of Jones."

They cite R. 521, which does not show anything about any "submerged arc process".

Also Petitioners' Brief, page 20, has a crude sketch purporting to illustrate the Robinoff process, with this legend:

> "Note electrode submerged in deep layer of flux in V formed by plates to be welded."

This sketch or diagram is taken from defendants' exhibit 108 (off. R. 766) which bears date October 5, 1927 (R. 901).

The record shows that Robinoff abandoned any idea of a submerged arc process prior to March 14, 1929—months prior to the issue of his patent. In his letter to his superior, bearing that date, Robinoff said:

> " * * * due to troubles encountered in producing a sound weld we abandoned the idea of submerging the electrode entirely under the flux * * *." (Pltf's Ex. 222, off. R. 534)

Robinoff testified that he never did know how to produce submerged arc welding (R. 547).

The first order for experimental pipe was dated September 10, 1929 (R. 506). Thus no pipe was welded until six months after Robinoff "abandoned the idea of submerging the electrode." The commercial production of pipe at the Christy Park mill was in 1931 and 1932.

All of the pipe produced by Robinoff was welded, not by any submerged arc process, but by his clay-flux process. The photograph reproduced at R. 1152, plaintiff's exhibit 225, offered R. 542, shows such process in operation at the Christy Park mill and shows a blazing open arc.

At p. 10 of Petitioners' Brief, they quote a sentence which refers to the arc as being submerged in the Robinoff process as used at Western Pipe & Steel Company. All this meant was that the clay flux was piled high and the arc obscured when viewed from the side, and if you looked down at an angle of about 45 degrees you could see the end of the electrode (R. 54-55). Lincoln's x-ray specialist, Dr. Nusbaum, had taken x-rays of a welding operation with

Robinoff clay flux, and these showed large openings through the flux layer. (Pltf's Exs. 229 A-E, R. 613-5)

On this point the Trial Court made this statement of fact in his opinion:

> "In the Robinoff clay flux method constant flashings occur, and the arc is always at least partially visible." (R. 907)

The Photograph Taken During the Graver Demonstration.

Here we have the reverse play. Having little or no faith in their efforts to create an impression that Robinoff had a submerged arc, petitioners also seek to create an impression that the Lincolnweld process has an open arc.

Petitioners' Brief, opposite p. 10, includes a photograph entitled "Demonstration of Lincolnweld Process." (Pltf's Ex. 188 AA, off. R. 214)

This photograph was taken during a demonstration the defendants staged at the Graver plant (R. 214). In looking at this photograph in Petitioners' Brief, the Court should compare it with Figure 2 which we inserted opposite p. 18 above, being the principal illustration of Lincolnweld operation in Lincoln's own catalog.

The record establishes that, in the Graver demonstration, defendants cut down the flux burden so there would be sparks and flashes to give a seeming resemblance to open arc welding.

In normal practice at the Graver plant, the depth of flux burden used was 1¾ inches (see statement of defendants' counsel at R. 628 and testimony of their chief engineer Landis at R. 635).

But during this particular demonstration at Graver, defendants used only a ¾-inch flux burden (R. 690).

Several witnesses testified that this Graver demonstration was not representative (R. 217-8, 222, 223, 345-6, 348-9).

No conceivable purpose was served by reducing the flux burden except to cause fireworks and give a superficial and erroneous semblance of an open arc (R. 223).

The Trial Court rejected the appearance of the Graver demonstration, in the finding that Lincolnweld "is identical in operation" with Jones *et al.* welding (Finding No. 20, R. 926).

Silicates Used by Jones *et al.* in Experiments.

Petitioners' Brief, p. 26, states:

> "The notes show that what they used was calcium silicate either alone or in combination with one or two of the others."

There are also other places where Petitioners' Brief seeks to give the impression that the inventors used only calcium and magnesium silicates in their experiments.

The record establishes that these inventors welded with all of the nine silicates listed in their specifications and that all nine silicates proved efficacious (R. 126-8; Opinion, R. 917).

Specifically, the notes show that Jones *et al.* welded with a manganese silicate with calcium fluoride added—identically the same thing as Lincolnweld 660 flux. This was flux No. 70 and the formula appears in the inventors' notes (Defts' Ex. 88, off. R. 425, rep. R. 1162). It was used in Test No. 424 and the results of that test appear in the notes (R. 1255).

Kennedy's testimony on this point was as follows:

> "We fused manganese dioxide and silica and welded with it, and I believe our judgment was that it was too penetrating; and then we added calcium fluoride to that, and we made a satisfactory flux of manganese silicate, which established in our minds

> that manganese would function as a base, as a basic material, in the same manner that calcium and magnesium had." (R. 43)

Also the first application filed by the inventors shows the same thing (Pltf's Ex. 126, off. R. 26, rep. R. 1051 and *cf.* Trial Court opinion, R. 920).

"Regrant" of Prior Art Fluxes.

The theme song which opens this so-called "Statement of Facts" and which makes its frequent appearance is:

> "The result of what the Court of Appeals has done is to regrant to respondent Linde the expired Lincoln, Robinoff and Miller patents." (Petitioners' Brief, p. 4)

But Lincoln's own chief engineer Landis admitted that not one of the old fluxes could be used in the Lincolnweld 660 flux (R. 770). Petitioners' welding expert Yeomans had not conducted any tests with prior art fluxes, and was not surprised to learn that none of them could be used in the Lincolnweld process (R. 749).

The Plaintiff's experts had made over 170 tests of the prior art fluxes and had found that in no instance was it possible to substitute one of those fluxes in the Jones *et al.* process (R. 853-4, Pltf's Ex. 236, off. R. 854, distributed as supplement to record). Defendants did not even cross-examine on these experiments.

Seizing on procedural devices such as "the use of an electric arc is old" (p. 5) and "flux protection likewise old" (p. 6), Lincoln seeks to divert attention from what is new in the Unionmelt process and composition. As Judge Swygert well put it in the opening paragraph of his opinion:

> "The first question to be decided in this case is: Did the patentees invent something patentable over the prior art of electric welding?"

The answer is yes by all four judges who have heard this case.

This attempt to stretch procedural devices such as these to hide thereby great developments and improvements in substance is eloquent with the admission that Lincoln is unable to match substance with substance.

Petitioners' Brief, p. 8, seeks to give the impression that some prior art fluxes used a molten layer of slag, rather than a gas, to protect the metal while being melted off the tip of the rod and transferred to the plate. The record and the findings clearly establish that all prior art fluxes depended upon the evolution of gas for such protection. Any slag came after the bead of metal was deposited.

Defendants themselves brought this out in their questions on cross-examination of Kennedy (R. 116):

> "Q. That shielding consists of the gases * * * that are emanated because of materials in the coating, and in the flux; * * *. And that shields the arc, and the welding zone from the contaminating influence of the atmosphere? A. Yes, sir.
>
> * * * * * *
>
> "Q. And the layer of slag which appears afterward comes also from the coating on the electrode, and is designed to protect the molten metal, and keep it from cooling too fast; that is correct, is it not? A. Yes, sir."

No Analogy to Electric Furnace.

Petitioners' Brief, p. 7, endeavors to point out a "close analogy between the electric furnace" and the Jones *et al.* welding. They assert that in the electric furnace the purpose of the flux is to keep the molten steel from contact with the air. There is no support for that proposition in the record and the partial quotation appearing at the top

of page 8 did not relate to the production of steel in an electric furnace (Pltf's Ex. 227, off. R. 543, rep. R. 898).

The record shows very clearly that the purpose of the flux in an electric furnace is to pick up and remove gangue materials and detrimental elements (R. 832-4). It becomes contaminated and would not serve as a satisfactory flux in welding (R. 833). In fact, the first experimental flux tried by the inventors, Flux No. 1, was a foundry slag (Defts' Ex. 88, off. R. 425, rep. R. 1153; R. 68). Such impure compositions cannot anticipate the composition of the patent. *Kuehmsted* v. *Farbenfabriken of Elberfeld Co.*, 179 Fed. 701 (C. C. A. 7th 1910), *cert. denied*, 220 U. S. 622 (1911).

The J. C. Lincoln Patent.

The J. C. Lincoln patent, by the time the trial was over, was so little regarded that it was not even mentioned by the Trial Court in the opinion or the findings—nor was it mentioned in the proposed findings rejected by that Court, which Lincoln's attorneys set forth in their Statement of Points (R. 939-940).

This patent was cited and considered by the Patent Office Examiner before allowing the patent in suit (Pltf's Ex. 127, off. R. 26, rep. R. 1133). The welding process invariably involved a blazing open arc, as admitted by defendants' witnesses, Yeomans (R. 572) and Landis (R. 772-3). The three flux materials specifically mentioned in the Lincoln patent are all of such character that they cannot and will not accomplish contact (Pltf's Ex. 236, off. R. 854, distributed as supplement to record).

The usefulness of the Lincoln patent was aptly summarized by Robinoff, in a letter dated March 18, 1929, to his superior, as follows:

> "The Lincoln people sell only carbon arc electric welding machines. The method employed in actual

use, that is, in machines that they market, is a descending roll, parallel to the carbon, of impregnated paper. This paper produces a slight slag on top of the weld. The quality of the weld is very poor, indeed, and is in no way comparable to our welds. Apparently they abandoned the idea altogether as expressed in their patent 1,589,017." (Pltf's Ex. 222, off. R. 534; R. 535)

Robinoff Clay Flux Process.

We have mentioned some highlights of the Robinoff clay flux process, at pp. 10-12 above. Also, we have shown that Robinoff did not have a "submerged arc", at p. ii of this Appendix.

The great differences between the "Robinoff" process and the invention in suit were fully covered by the Trial Court in his opinion and findings (R. 907-8, 911-14, 924-5 and 927).

Here, once again, Petitioners' Brief, at pages 15-16, makes much of the fact that the process of the patent in suit utilizes the same procedural steps as Robinoff. It is hard to see the importance of this fact. Chemical processes frequently employ the same procedural steps—that is, you put some chemicals in a vat—you heat—and stir—and what takes place in the vat, in one process, may have nothing whatever in common with what takes place in the vat in another process.

The patentees described the procedural steps of the Robinoff process on page 1 of their patent (R. 955). They did not claim that they invented any new welding head or other apparatus. The welding process is what takes place in the welding zone, under the quiet blanket of granular flux—a matter we have discussed at some length above, pp. 31-38.

The Robinoff patent failed to disclose the ingredients for the welding flux except that it was to contain iron oxide (R. 536). In fact, the formula for the flux was deliberately kept secret (R. 549).

The feature emphasized in the Robinoff patent was the idea of putting iron oxide in the flux to make it magnetic. This is mentioned several times in the specifications and is included as an element in six out of the eight claims (Defts' Ex. 103, off. R. 460, rep. R. 974 *et seq.*). This idea was fallacious. Iron oxide is not magnetizable in the molten state or at any temperature even close to it, as Lincoln's own expert admitted (R. 758).

Another fallacious feature of the Robinoff patent is the sketch, Figure 3 (R. 974). This shows the welding rod extending down through the molten flux and into the molten steel. That is not possible in a welding operation, since the current would be short-circuited, as defendants' own expert admitted (R. 757).

An inoperative patent cannot act as an anticipation.

> *Seymour* v. *Osborne*, 11 Wall. 516, 522 (U. S. 1870);
>
> *Williams Iron Works Co.* v. *Hughes Tool Co.*, 109 F. 2d 500, 510 (C. C. A. 10th 1940);
>
> *Electrical Engineers' Equip. Co.* v. *Champion Switch Co.*, 23 F. 2d 600, 603 (C. C. A. 2d 1928);
>
> *Star Can Opener Co.* v. *Owen Dyneto Co.*, 16 F. 2d 353, 355 (C. C. A. 2d 1926).

The only companies who used the Robinoff process were the National Tube Company and Western Pipe & Steel Company. The process used by those companies did not employ iron oxide as recommended in the Robinoff patent. Instead the flux was a natural clay with lime and ferromanganese

mixed in. Plaintiff's demonstration, which the Trial Court found to be representative, illustrated the large amount of flame, smoke and fumes produced, and the solidified slag when removed from the weld was completely honeycombed by air bubbles. This gas produced the holes or porosity which caused Western Pipe & Steel Company to call in our three inventors (R. 32, 57, 121, 541, 879).

Our evidence conclusively established that there was no contact of the rod with the molten flux in the Robinoff process (R. 796-7, 252-3). In fact, the X-rays produced by Lincoln's own expert (Pltf's Ex. 229 A-E, off. R. 797; R. 613-5) show that there was no contact in the Robinoff process. Robinoff himself testified that he did not know whether there was contact—or whether the flux was electrically conductive when molten—and that he never made any experiments or tests on the subject (R. 547).

Robinoff's so-called new electricweld department was operated for only about a year beginning July, 1931 and then entirely closed down except for a few tons produced in 1935 (R. 508, 539-540). The use of the Robinoff process at Western Pipe & Steel Company was discontinued in 1932 (R. 393).

Both National Tube Company and Western Pipe & Steel Company are now licensees under the Jones *et al.* patent (R. 395, 398).

We have already called attention to the fact that Lincoln did not take a license under the Robinoff patent until three years after the actual installation of the Lincolnweld process at the Graver plant in East Chicago—see above, page 19.

Petitioners' Brief mentions the fact that the plaintiff took a license under the Robinoff patent. The Linde Company took this license in April, 1938. It already had granted thirty licenses and was shortly thereafter to make the public

announcement offering the Unionmelt process for licensing to all comers; and it therefore wished to avoid any possibility of litigation which might delay this licensing program (R. 426). The only part of the Robinoff process practiced by those licensees was placing a flux on the work to be welded (R. 435).

Petitioners' Brief at page 11 and elsewhere talks about Robinoff's "aluminum silicate" flux and seeks to give the impression that this was a silicate just like one of those used by Jones *et al.*

Such talk is absurd as a matter of chemistry and common sense. The clay flux used at Western Pipe & Steel Company was the starting point of the inventors' experiments. This was stated on page 1 of the patent, where a full and accurate analysis of that flux is given (R. 955). *Jones et al.* discovered how to prepare and use compositions which would perform in an entirely different manner and produce results which "dwarf" those anyone else had achieved.

The Trial Court stated:

> "The clay flux composition used with the Robinoff process at the Western Pipe & Steel Company evolved a large volume of gas during welding. Jones *et al.* concluded that this gas caused the porosity in the clay flux welding. They determined they would avoid the evolution of gas in the welding operation by developing a welding composition in which all reactions were entirely completed by prefusing at a high temperature." (Finding No. 6, R. 924)

The compositions in suit, without exception, are prefused in accordance with the mandatory direction of the patent that all chemical reactions be completed before use (p. 2, col. 1, ll. 42 *et seq.*, R. 956). The clay flux was nothing

more than a mechanical mixture of clay, lime and ferro-manganese which had been pulverized and heated considerably short of prefusion and then put into a tumbling barrel so as to intermix the ingredients thoroughly (R. 514-15). This difference (between mechanically mixed ingredients and a new compound formed by fusion of ingredients) was clearly admitted by defendants' counsel (R. 329). Thus the clay flux violated the mandatory direction of the patent specifications that the composition be completely reacted to avoid the evolution of gas.

The clay flux violated a second mandatory direction of the patent specifications, namely, that "the composition should be substantially anhydrous" (p. 2, col. 1, ll. 7-8, R. 957). Moisture is always present in clay in the form of "chemically combined water" which is not driven off unless the clay is heated to the point of fusion (R. 310, 311). Mr. Robinoff admitted that his flux was never heated to this extent (R. 514-515).

The inventors found it almost impossible to prefuse the Robinoff clay flux and also found that it was not usable for welding, after an attempt at prefusion had robbed it of its gas-generating qualities (Defts' Ex. 88—flux No. 21 and test No. 138, R. 1155, 1206-7).

Robinoff's oral testimony in important respects was squarely impeached by his own letters. For example, his oral testimony that he never understood what was in his patent (R. 534; 549) was belied by his contemporaneous letters (Pltf's Exs. 222, 226, 227, off. R. 534, 543; Ex. 227, rep. R. 897).

His bias in testifying arose out of the fact that he had been hired by The Lincoln Electric Company on January 1, 1943 and under his employment he was to be available to the defendants for the purposes of this lawsuit (R. 531-2).

The Miller Patents.

Petitioner's Brief, p. 64, refers to Miller's manganese silicate as being one of the things that the judgment below has given to the Linde Company.

Miller's three patents were in fact all owned by Oxweld Acetylene Company, an affiliate of the Linde Company, as being useful in gas welding (R. 1347, 1349, 1351). The fact that the Linde Company, already having the Miller patents available, have up to this time paid Jones *et al.* $1,200,000 is clear indication that there was quite a difference between the two (R. 44).

Some confusion is created by Lincoln's attempt to intertwine the three Miller patents as a single entity. The law is clear that each patent is to be considered on its own merits. The words of an able jurist, learned in the patent law, should be kept in mind. In *Dewey & Almy Chemical Co.* v. *Mimex Co.*, 124 F. 2d 986 (C. C. A. 2d, 1942), the Court (per L. Hand, C. J.) said (p. 989):

> "No doctrine of the patent law is better established than that a prior patent or other publication to be an anticipation must bear within its four corners adequate directions for the practice of the patent invalidated. If the earlier disclosure offers no more than a starting point for further experiments, if its teaching will sometimes succeed and sometimes fail, if it does not inform the art without more how to practice the new invention, it has not correspondingly enriched the store of common knowledge, and it is not an anticipation."

Accord:

> *Lincoln Stores, Inc.* v. *Nashua Mfg. Co.*, 157 F. 2d 154, 159-160 (C. C. A. 1st, 1946), *cert. denied*, 329 U. S. 811 (1947).

At the trial the only attempt made by the defendants to show the possibility of substituting a prior art flux in the Jones *et al.* process was defendants' exhibit 150 (off. R. 769)—a deposition of metal using a flux prepared as taught by Miller Patent No. 1,748,785. It should be noted that this was not a weld, but merely a bead deposited on the top of a solid plate (R. 749-50).

This bead had transverse and longitudinal cracks (R. 843-4).

Welds produced by using the Miller boro-silicate flux in place of Unionmelt, had no ductility or tensile strength and were as brittle as glass (R. 844-6). A sample weld is in evidence, Plaintiff's Exhibit 234 (off. R. 845). A successful weld cannot be produced by this flux in the Unionmelt process (R. 850).

The Miller boro-silicate is not a silicate but a different type of compound (R. 776). This fact alone distinguishes Miller patents Nos. 1,741,031 and 1,748,786.

The third Miller patent, 1,754,566, said the District Court,

> "* * * teaches the use of a manganese silicate coating in electric welding."

The preferred form of Miller coating or flux was not preformed.

The Trial Court further pointed out that Jones, *et al.* requires that the acidic and the basic constituents of the composition be prefused or reacted.

The Court concluded:

> "Therefore, it cannot be said that the composition claims herein held valid are anticipated by the teachings of Miller."

For a more detailed review of these three Miller patents see the notes in reference to them on our charts, Plaintiff's

Exhibit 236 (off. R. 854, distributed as supplement to record).

Unionmelt 90.

Petitioners' Brief, p. 24, refers to the calcium magnesium silicate (Unionmelt Grade 20) and says:

> "It is the flux respondent used in attaining its 'extensive commercial success'."

Petitioners' Brief nowhere mentions that the Linde Company also sold another type of flux, Grade 90 Unionmelt. It was placed on the market in May, 1940 (R. 834-5). This was long prior to the introduction of Lincolnweld 660 flux in 1942 (R. 471). Like Lincolnweld 660 flux, Grade 90 Unionmelt was a predominately manganese silicate flux, and it was used in industry for identically the same purpose as Lincolnweld 660 (R. 257, 345, 840).

Petitioners in their brief, at pages 24-25, talk about the "broad categories of claims" upheld by the Court of Appeals. Petitioners fail to mention the five "musts" set forth in the patent—and the common-sense principle that the patent must be read and construed as a whole (see above pages 84 *et seq.*).

Petitioners' Brief, pages 26-27, then seeks to construe the patent as not teaching a predominately manganese silicate. We have covered this matter above at page 59 *et seq.*

In answer to pages 33-50. "I. Process claims invalid—as written they cover nonexistent process—as interpreted they re-claim prior art."

A misstatement appears at page 35 of Petitioners' Brief. In speaking generally of the "patent as issued"

and therefore of the specifications and claims generally, they state:

> "The Trial Court, however, found that the process so described and claimed *'does not in point of fact exist'* ". (Emphasis in original.)

The words quoted from the opinion of the Trial Court, in fact, related only to the "import" of the group of nine process claims. This portion of the Trial Court's opinion read as follows:

> "Process claims 5, 6, 11, 12, 13, 14, 15, 16 and 17 are invalid for another reason. The import of each of these claims is that the sole conducive medium through which the electric current passes from the electrode to the base metal is the welding composition which is in a molten state and that the electric arc phenomenon is not present. To make a claim for a welding process in which these erroneous ideas are incorporated is to stake out a process or means of welding which does not in point of fact exist within the invention."

The Trial Court had already found that a new process of welding had been invented and had been properly described in the specifications.

Petitioners' Brief, at page 43, quotes from a later patent issued to Jones. The language they quote describes the start of the welding operation. That patent then continues to say that the granular material "is locally fused and becomes highly fluid and superheated." (Defts' Ex. 137, col. 1, ll. 26-27, off. R. 699, rep. R. 979).

Petitioners' Brief, pages 44-45, cites several cases for the proposition that a patent is invalid where it covers only a result.

These cases, the most recent of which is *Halliburton Oil Well Cementing Co.* v. *Walker*, 329 U. S. 1 (1946), are irrelevant. As we have shown above, the essential elements of the process in suit are carefully and accurately described, the features distinguishing it from other methods of welding, particularly contact, pointed out, and the kind of compositions necessary to make contact possible explained at length, with directions for several particular ones given by way of illustration.

The teachings of the patent have enabled the 740 licensees to practice the Jones *et al.* invention and to obtain great benefits and advantages (R. 395 *et seq.*).

The Trial Court stated:

> "The patent's specification contains a sufficient disclosure of the method of welding invented to enable persons 'skilled in the art' to accomplish the objective by following the teachings outlined in it." (R. 914)

And the Court of Appeals stated:

> "Plaintiff's process was quite different from that of the prior art disclosures in that the latter depended on the evolution of more gas to protect the molten metal, while plaintiff's proceeds on the theory of eliminating all gas forming ingredients. That difference is clearly one of process. True, plaintiff's process contemplated and depended upon a different composition of flux, and the patent was issued on both process and flux composition, and we think rightly so. There are as many different kinds of flux as there are elements and combinations of elements, and when thus used their results are quite as numerous. However, this patent was not granted upon a result, but it was granted upon a process or method which produced a much desired result, and which was then unknown to the art. Any other

process or method which produces the same result would not infringe this process patent, provided it does not use this method or its equivalent, and this would be true regardless of what flux, if any, was used for such purpose." (R. 1002)

All of the matters covered in this portion of Petitioners' Brief have been more fully covered in our Statement of The Case above, page 3 *et seq.*

As to whether the group of nine process claims should properly be construed as "importing" an areless process, see above, page 65 *et seq.*

As to whether the group of six process claims should have specified the chemical constituents, see above, page 81 *et seq.*

As to the argument that the invention was abandoned and cancelled, see page i of this Appendix.

In answer to pages 51-66. "II. Flux claims of patent neither valid nor infringed—as written they go beyond invention—as interpreted they embrace prior art."

In this part Petitioners' Brief mostly includes matters which we have already covered as follows:

The general state of the prior art, see above, page 7 *et seq.*

Whether the patent taught the use of manganese as a major constituent, see above, page 59 *et seq.*

The question whether Claims 2, 24 and 26 were too broad as covering all "silicates" and "metasilicates", see above, page 91 *et seq.*

Whether any of the Miller patents anticipated the Jones *et al.* patent, see p. xiv *et seq.* of this Appendix.

This point concludes with the assertion that the composition claims "are invalid because they embrace inoper-

able compounds", page 65 of Petitioners' Brief. Petitioners then state "the sole basis for the court's decision on the flux claims is, it will be recalled, the statement in the specification * * *."

We do not recall any such thing. The court's decision on the flux claims was based, as well, on other direct evidence. Kennedy and others gave detailed testimony—and Kennedy made the following statement under oath:

> "this factor is common to all of them, that a conductive melt is formed; that when an electrode is in contact with this conductive melt, metal will be deposited which is sound and good." (R. 128)

The defendants did not challenge the above statement on cross-examination, nor did they introduce any evidence to show inoperability as to any of the nine silicates.

Petitioners' Brief, pp. 65-66, seeks to use the inventors' notes to show inoperability as to three of these silicates:

> Iron silicate;
> Magnesium silicate;
> Sodium silicate.

They have misread the inventors' notes.

Iron silicate. The reference in Petitioners' Brief is to Flux No. 41 used in Test No. 299. That flux was prepared in an oil fired furnace. A later flux—Flux No. 47—was prepared in an electric furnace. An oil fired furnace is not adequate to reach the high temperature required to prefuse an iron silicate—but an electric furnace is. Flux No. 47 was used in Test No. 321 and was found satisfactory (R. 1236). This difficulty in prefusing iron silicate explains the statement the inventors made to the Patent Exam-

iner quoted at the bottom of p. 65 of Petitioners' Brief.

Magnesium silicate. Flux Nos. 51 and 56 were made from magnesium silicate and were used in Tests Nos. 332-3 and 347-352. The reference in Petitioners' Brief, page 66, relates to Test No. 349 only. In that test contact of the rod with the molten flux was not present, for the notes show the common "blue arc bottom" (R. 1242) and porosity resulted. Tests Nos. 350, 351 and 352 with this magnesium silicate flux did show satisfactory welding results (R. 1242).

Sodium silicate. Petitioners' Brief refers to Test No. 340 in which Flux No. 55 was used. This flux was a mechanical mixture which was not prefused (R. 1161). Thus it violated the mandatory requirement of the patent, neglect of which "most surely invites porosity." (p. 2, col. 1, ll. 45, R. 956) Flux No. 55 also contained chemically combined water, which would be driven off only by prefusion and thus it violated the mandatory requirement that the welding composition be substantially anhydrous p. 3, col. 1, ll. 7, R. 957). The complete comment on Test No. 340 in the inventors' notes was:

> "Beautiful, flat, wide weld. Perfect on back. Sodium gives round holes."

So this weld was a lot better than any Robinoff ever produced. If this flux had been prefused in conformity with the teachings of the patent there would have been no porosity.

The inventors' notes were a contemporaneous shop record of the experiments through which they determined

what "properties" the flux should have, and what ingredients should be used and what proportions and requirements should be embodied in the specifications. Naturally some tests succeeded and some failed. That is how the inventors acquired the knowledge set forth in the specifications.

The notes show that the welds became better and better as the inventors progressed. Occasionally holes or other defects are noted during these experiments. But substantially all of them were better than welds made with the Robinoff or clay flux process. The latter produced welds which the Trial Court found (Opinion, R. 907) contained a "great amount of porosity"—yet defendants themselves refer to that clay flux as used for "over 1,000 miles of welded pipe." (Petitioners' Brief, p. 11)

In answer to pages 67-68. "III. The whole has been implemented by unlawful tying agreements."

We have covered the question of the misuse of the patent under Point VIII above, pages 94-98.